B.Tech. (Information Technology)

2015 Regulations, Curriculum & Syllabi

BANNARI AMMAN INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai

Approved by AICTE - Accredited by NBA New Delhi, NAAC with 'A' Grade and ISO 9001:2008 Certified)

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REGULATIONS 2015

(CHOICE BASED CREDIT SYSTEM)

(Common to all B.E./B.Tech. Degree Programmes)

Regulation 2015 has been prepared in accordance with the guidelines given by the University Grants Commission, All India Council for Technical Education and affiliating University incorporating the features of the Choice Based Credit System (CBCS). The Regulation 2015 is applicable to the candidates admitted to the Bachelor of Engineering (B.E.) / Bachelor of Technology (B.Tech.) Degree Programmes of the Institution in the academic year 2015-2016 for Regular admission (Academic year 2016-2017 for Lateral Entry) and subsequently.

The regulations hereunder are subjected to amendments as may be decided by the Academic Council of the Institution from time to time. Any or all such amendments will be effective from such date and to such batches of students (including those already in the middle of the programme) as may be decided by the Academic Council.

1. ADMISSION

Candidate, seeking admission to the B.E./B.Tech. Programme, shall satisfy the conditions of admission prescribed by the Directorate of Technical Education and Anna University, Chennai as given below.

1.1 Regular Admission

Candidates, for admission to the first semester of the eight semesters B.E./B.Tech. Degree Programmes, shall be required to have passed:

- Higher Secondary Examination (10 +2) of Curriculum (Regular Academic Stream) prescribed by the Government of Tamil Nadu with Mathematics, Physics, and Chemistry as three of the four subjects of the study prescribed under Part-III or any other examinations of any Board or University or authority accepted by the Syndicate of the University / Directorate of Technical Education (DoTE), Chennai as equivalent thereto.

(or)

- Should have passed Higher Secondary Examination of Vocational Stream (Engineering/Technology), prescribed by the Government of Tamil Nadu.

1.2 Lateral Entry Admission

1.2.1 The candidates who possess Diploma in Engineering / Technology awarded by the State Board of Technical Education and Training, Tamil Nadu or its equivalent are eligible to apply for Lateral Entry admission to the third semester of B.E. / B.Tech. Programmes in the branch of study as per the eligibility criteria prescribed by the Directorate of Technical Education from time to time.

(or)

1.2.2 The candidates who possess the Bachelor Degree in Science (B.Sc.) (10+2+3 stream) with Mathematics as a subject in B.Sc. is eligible to apply for Lateral Entry admission to the third semester of B.E./B.Tech. Programmes, as per the eligibility criteria prescribed by the Directorate of Technical Education from time to time. Such candidates shall undergo two additional Engineering subject(s) one each in third and fourth semesters, as bridge courses.

2. PROGRAMMES OFFERED

A candidate may be offered admission to any one of the programmes offered by the Institution for the candidates specified in Clause 1.1 and as per the eligibility criteria of DoTE for the candidates under Clause 1.2 from the list given below:

B. E. Programmes

i. Aeronautical Engineering
ii. Agricultural Engineering
iii. Automobile Engineering
iv. Civil Engineering
v. Computer Science and Engineering
vi. Electrical and Electronics Engineering
vii. Electronics and Communication Engineering
viii. Electronics and Instrumentation Engineering
ix. Mechanical Engineering
x. Mechatronics

B. Tech. Programmes

i. Biotechnology
ii. Fashion Technology
iii. Information Technology
iv. Textile Technology
v. Food Technology

3. STRUCTURE OF THE PROGRAMME

3.1 Every programme shall have a distinct curriculum with syllabi consisting of theory, laboratory, mini-project, life-skills and personality development courses, as prescribed by the respective Boards of Studies, broadly categorized under:

(i) **Basic Science** courses including Mathematics, Physics, Chemistry and further specialization in these subjects

(ii) **Basic Engineering c**ourses including Engineering Graphics, Workshop Practices, Basics of Electrical, Electronics, Civil, Mechanical Engineering, Engineering Mechanics and Computer Programming.

(iii) **Humanities and Social Science c**ourses including Language Courses, Management Courses, Life Skills and Professional Ethics.

(iv) **Professional Courses** include Discipline Core Courses, Professional Electives, Core Electives and Open Electives.

(v) **Employability Enhancement Courses (EEC)** include Project Work and /or Internship, Seminar, Industrial /Practical Training, Value Added and Certificate Courses.

The assortment of different courses shall be designed that the student, at the end of the programme, would be able to be trained not only in his / her relevant professional field but also as a socially mindful human being.

The medium of instruction is English for all the Courses, Examinations, Seminar Presentation, Projects and any other courses that a student registers for.

3.2 Each course is normally assigned a certain number of credits, with 1 credit per lecture period per week, 1 credit for 2 periods of tutorial, 1 credit for 2 periods of laboratory courses, and 1 credit for 2 periods of seminar/project work per week.

3.3 A Diagnostic Test will be administered to all the B.E. / B.Tech. students after the admission to assess the proficiency in English and based on the score they will be brought under two streams namely, Stream A and Stream B. Students under Stream A will study **Communicative English I** and Stream B will study **Basic English I** under Language Elective I in the First Semester. In the Second Semester, Stream A will be further divided into two categories based on their English language proficiency assessed in the Continuous Assessment, while the upper segment can

enroll and study **German / Japanese / French / Chinese / Hindi** and the remaining students of that Stream will study **Communicative English II**. The students under Stream B will study **Basic English II** or may opt for **Communicative English II** based on the assessment carried out at the end of the semester I.

3.4 Every student shall be required to opt for **Nine** electives from the list of electives. Students can opt for the electives (Core / Professional / Open Elective) from any branch of B.E/B.Tech. Programmes, besides his / her own discipline courses, during V to VIII Semesters, if he/she satisfies the prerequisite for that particular course.

3.5 However, out of nine electives, every student shall be required to opt for, a minimum of three electives as open electives from the list of open electives of the branch / branches other than his / her branch of specialisation. There shall be no pre-requisite course(s) for such open electives.

3.6 Students can also opt for **one-credit courses** of 15 to 20 hour duration, which will be offered by the experts from the industry on specialised topics. Students can opt for such **one-credit courses** during the semesters I to VII as and when these courses are offered. A student will also be permitted to register the **one-credit courses** offered by other Departments, provided the student has fulfilled the necessary pre-requisites or the courses that may not require any pre-requisites. Under no circumstances, the same one credit course shall be repeated in subsequent semesters in any Department / Centre and a maximum batch size for a given course shall not exceed 40. In the case of disciplines with multiple divisions (intake more than 60) different course(s) shall be offered to other batch(es) of students.

On successful completion of one credit courses, Credits will be indicated in the Grade Sheet, but will not be considered for computing the Cumulative Grade Point Average (CGPA). However, if a student wishes to avail the exemption from any one of the Electives (other than open elective) of the Semester VIII, he / she can do so by exercising his / her option in writing to the respective Head of the Department during the beginning of the VIII Semester, following the equivalence norm, that **one regular elective (**in the **VIII Semester)** is equivalent to **three one-credit courses** completed by the student during the previous semesters, IV to VII. Details of the one credit courses offered by the department shall be forwarded to the Office

of the Controller of Examinations. However one credit courses completed during I to III semesters shall be maintained in the Grade sheet as "Additional credits earned" (not considered for the computation of GPA/CGPA).

3.7 Fast Track System shall enable students to undergo a semester-long Internship or Special Training during Semester VIII. A student who secures a minimum CGPA of 8.50 in Semester IV with no current arrears, as on that date and maintains the CGPA of 8.50 till VI Semester without any arrears shall be eligible to opt for Fast Track System and such student is required to complete three elective courses satisfactorily, while completion of Semester VII, as additional Credits during the semesters V to VII.

3.8 Every student shall be required to carry out a Project Work in the Department / Industry or by exercising Fast track during VIII Semester in consultation with the Faculty Guide and submit the project report, in the prescribed format, at the end of the VIII Semester for the valuation.

3.9 A student can register for Self-Study Elective(s) over and above the electives from any branch of Engineering / Technology at the rate of one per semester starting from V semester onwards provided he/she maintains a Cumulative Grade Point Average (CGPA) of 8.50 or above till the previous semesters with no current arrears. Credits will be indicated for such courses in the grade sheets (additional credits) but will not be considered for computing the CGPA.

3.10 A Student may be permitted to credit online courses with the approval of the Departmental Consultative Committee constituted by the Head of the Department, subject to a maximum of three credits. Such students may be exempted from attending the classes, if such course(s) are offered in the semester. Summary of such on-line courses, taken by the students, along with the offering agency shall be presented to the Academic Council for information and further suggestions. However, those students need to obtain certification from the agency / agencies offering the course, to become eligible for writing or seeking exemption (core elective course) from the End Semester Examination. In case of credits earned through online mode, from the other Institute / University, the credits may also be transferred directly after due approval from the Departmental Consultative

Committee and the Office of the Controller of Examinations. A student can get exemption for a maximum of 3 credits during the entire programme (in lieu of Discipline elective or Open elective).

4. VALUE ADDED COURSES / ADD-ON COURSES

A Student can opt for the Value Added Courses / Add-on Courses offered by the various Department / Centres for which the batch size will not exceed 40 per course from Semester II to VII. Head of the Department / Centre shall submit the list of such courses, duly approved / ratified by the Academic Council, to the Controller of Examinations to administer the examination process. A separate Certificate will be issued on successful completion of the course by the Office of the Controller of Examinations.

5. DURATION OF THE PROGRAMME

5.1 A regular student (admitted after 10+2) or equivalent is normally expected to satisfactorily fulfil the requirements for award of the degree B.E. / B.Tech. within four academic years (8 semesters) from the date of admission but in any case not more than 7 years (14 Semesters); lateral entry students shall fulfil such requirements within three academic years (6 semesters) from the date of admission but in any case not more than six years (12 Semesters) leading to the award of Degree of Bachelor of Engineering (B.E.) / Bachelor of Technology (B.Tech.) of Anna University, Chennai.

5.2 The total period for completion of the programme from the commencement of the semester, to which the student was admitted, shall not exceed the maximum period (Clause 5.1), regardless to the break-of-study (vide Clause 15) or period of prevention in order.

5.3 Each semester shall consist of minimum 90 working days or 450 periods of 60 minutes each or equivalent. Head of the Department shall ensure that every faculty member teaches the subject / course as prescribed in the approved curriculum and syllabi.

5.4 Special Theory / Practical Sessions may be conducted for students who require additional inputs over and above the number of periods normally specified

(Remedial Classes), as decided by the Head of the Department, within the specified duration of the Semester / Programme.

6. COURSE ENROLLMENT AND REGISTRATION

6.1 Each student, on admission shall be assigned to a Faculty Advisor (vide Clause 8) who shall advise / counsel the student about the details of the academic programme and the choice of course(s) considering the student's academic background and career objectives.

6.2 Every student shall enroll for the courses of the succeeding semester, in the current semester. However, the student shall confirm the enrollment by registering for the courses within the first five working days after the commencement of the semester concerned.

6.3 After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the End Semester Examinations.

6.3.1 Each student, on admission to the programme, shall register for **all the courses prescribed in the curriculum in** the **first Semester of study (III Semester** for students admitted under **lateral entry stream).**

6.3.2 The enrollment for all the courses of the Semester II will commence 10 working days prior to the last working day of Semester I. The student shall confirm the enrollment by registering for the courses within the first five working days after the commencement of the Semester II. In the case, if a student fails to register in the course(s), he/ she may be permitted to register the same, as specified in the Clause 6.5, in the subsequent semester or when it is offered.

6.3.3 The enrollment for the courses of the Semesters III to VIII will commence 10 working days prior to the last working day of the preceding semester. The student shall enroll for the courses with the guidance of the student's Faculty Advisor. If a student wishes, the student may drop or add courses (vide Clause 6.4) within **five** working days after the commencement of the semester concerned and complete the registration process duly authorized by the Faculty Advisor.

6.4 Flexibility to Add or Drop courses

6.4.1 A student has to earn the total number of credits specified in the Curriculum of the respective Programme of study in order to be eligible to obtain the degree. However, if a student wishes, the student is permitted to earn more than the total number of credits prescribed in the curriculum by opting for one- credit courses, self study electives or additional courses.

6.4.2 From the III to VIII semesters (from IV to VIII Semesters in case of lateral entry students), the student has the option of registering for additional courses or dropping existing courses. Total number of credits of such courses cannot exceed 6 in a given Semester. However the maximum number of credits that a student can register in a particular semester shall not exceed 30 credits (regardless to the reappearance credits). In such cases, the attendance requirement as stated Clause 7 is mandatory.

6.4.3 The minimum number of credits that a student can register in a particular semester shall not be less than 18 credits (except VII / VIII semester).

6.4.4 The student shall register for the project work in the VIII semester only.

6.5 Reappearance Registration

6.5.1 If a student fails in a theory course, the student shall do reappearance registration (Examination) for that course in the subsequent semesters or when it is offered next.

6.5.2 On registration, a student may attend the classes for the reappearance registration courses, if the student wishes, and the attendance requirement (vide Clause 7) is not compulsory for such courses.

6.5.3 However, if a student wishes to improve his/ her continuous assessment, in the second attempt during reappearance, shall satisfy the Clause 6.5.5 and appear for continuous assessment as given for that particular course.

6.5.4 If the theory course, in which the student has failed, is either a professional elective or an open elective, the student may register for the same or any other professional elective or open elective course, respectively in the subsequent semesters. However, the change of elective courses is permitted only once.

6.5.5 In this case (Clause 6.5.4), the student shall attend the classes, satisfy the attendance requirements (vide Clause 7), earn Continuous Assessment marks and appear for the End Semester Examination.

6.5.6 The student who fails in any Laboratory Course/ Project work / Seminar or any other EEC courses (Specified in Clause 3.1) shall register for the same in the subsequent semester or when offered next, and **repeat** the course as per Clause 6.5.5.

6.5.7 If a student is prevented from writing the end semester examination of a course or several courses due to lack of attendance, the student has to register for that / those course(s) again, when offered next, attend the classes and fulfill the requirements as per Clause 6.5.5 & 6.5.6. If the course, in which the student has 'lack of attendance', is a Core Elective or an Open Elective, the student may register for the same or any other Core Elective or Open Elective course(s) respectively in the subsequent semesters and appear in the examination as per Clause 6.5.5.

7. REQUIREMENTS FOR APPEARING FOR THE END SEMESTER EXAMINATION OF A COURSE

A student who has fulfilled the following conditions (vide Clause 7.1 and 7.2) shall be deemed to have satisfied the attendance requirements for appearing for End Semester Examination of a particular course.

7.1 Every student is expected to attend all the periods and earn 100% attendance. However, a student shall secure not less than 80% attendance (Physical presence) course wise taking into account the number of periods required for that course as specified in the curriculum.

7.2 If a student, secures attendance between 70% and 79% in any course(s) in the current semester due to medical reasons (prolonged hospitalization / accident / specific illness) or participation in Institution/ University/ State/ National/ International level extra and co-curricular activities, with prior permission from the Head of the Department, shall be permitted to appear for the current semester examinations subject to the condition that the student shall submit the medical certificate / participation certificate attested by the Head of the Department (along

with Condonation form). Such certificates along with the condonation forms shall be forwarded to the Controller of Examinations for verification and permission to attend the examinations. However during the entire programme of study, a student can avail such Condonation in any two semesters only (regardless the number of courses).

7.3 A student shall normally be permitted to appear for End Semester Examination of the course(s) if the student has satisfied the attendance requirements (vide Clause 7.1 – 7.2) and has registered for examination in those courses of that semester by paying the prescribed fee.

7.4 Students who do not satisfy Clause 7.1 and 7.2 and who secure less than 70% attendance in a course will not be permitted to write the End-Semester Examination of that course. The student has to register and repeat this course in the subsequent semester or when it is offered next (vide Clause 6.5).

7.5 In the case of reappearance registration for a course (vide Clause 6.5), the student has to register for examination in that course by paying the prescribed fee.

7.6 A student who has already appeared for a course in a semester and passed the examination is not entitled to reappear in the same course for improvement of grades.

8. FACULTY ADVISOR

To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a Faculty member of the Department who shall function as Faculty Advisor for those students. The Faculty Advisor shall advise and guide the students in registering of courses, reappearance of courses, monitor their attendance and progress and counsel them periodically. If necessary, the Faculty Advisor may also discuss with or inform the parents about the progress / performance of the students concerned.

9. COMMITTEES

9.1 Common Course Committee

9.1.1 A theory course handled by more than one faculty including the discipline with multiple divisions (greater than or equal to 2) shall have a “Common Course Committee” comprising of all members of faculty teaching that course with one

of the members as the Course Coordinator, nominated by the Head of the Institution (Head of the Department in the case of multiple divisions of a discipline) and student representatives (one per specialization or division) registered for that course in the current semester.

First meeting of the Common Course Committee shall be held within fifteen days from the date of commencement of the semester. Two subsequent meetings in a semester may be held at suitable intervals. During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to all the students.

9.1.2 In addition, Common Course Committee (without the student representatives) shall meet to ensure uniform evaluation through the common question papers during Continuous Assessment and End Semester Examinations.

9.2 Class Committee Meeting

For all the courses taught, prescribed in the curriculum, Class Committee meeting shall be convened thrice in a semester (first meeting within 15 days from the commencement of the semester and other two meetings at equal interval after the first meeting) comprising members of the faculty handling all the courses and two student representatives from the class.

One of the members of the faculty (preferably not handling any courses to that class), nominated by the Head of the Department, shall coordinate the activities of the Committee. During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to all other students.

10. SYSTEM OF EXAMINATION

10.1 Performance in each course of study shall be evaluated based on (i) Continuous Assessment throughout the semester and (ii) End Semester examination at the end of the semester for the regular courses or as given in the Clause 16. However, the

final examination in the case of one credit courses / certificate / value added courses may be conducted, as and when the course is completed, through the office of the Controller of Examinations.

10.2 Each course, both theory and practical including project work, shall be evaluated as per the Scheme of Assessment given in Clause 16.

10.3 The End Semester Examinations shall normally be conducted after satisfying the Clause 5.2. Supplementary Examinations may also be conducted, at such times, for the benefit of the students as decided by the Controller of Examinations.

10.4 For the End Semester examinations, both theory and practical courses including project work, the internal and external examiners (from Academia or Industry) shall be appointed by the Controller of Examinations as per the guidelines given by the Examination and Evaluation Board of the Institute.

11. PASSING REQUIREMENTS AND PROVISIONS

11.1 A student who secures not less than 50% of total marks prescribed for a course, vide Clause 16, comprising a minimum of 50% of the marks prescribed for the End Semester Examination, shall be declared to have passed the course successfully and earned the prescribed credits for that course, applicable for all registered courses.

11.1.1 If a student fails to secure a pass in a particular course, i.e., failing to obtain minimum marks, as stated above, it is mandatory that he/she shall register and reappear for the examination in that course in the subsequent semester(s) whenever the examinations are conducted for that course, till he / she secures a 'Pass'.

11.1.2 Continuous Assessment (CA) marks obtained by the student in the first appearance shall be retained and considered valid for one subsequent attempt, except Clause 6.5.4, 6.5.5, 6.5.6 and 6.5.7. However, from the third attempt onwards, the student shall be declared to have passed the course if he/she secures a minimum of 6 Grade Points (B Grade) in the course prescribed during the End Semester Examinations.

11.2 The minimum number of total credits to be earned by a student to qualify for the award of Degree in the various branches of study as prescribed by the respective Boards of Studies is given below:

Branch of Study	Minimum Credits	
	Regular Admission	Lateral Entry
B.E. Programmes		
Aeronautical Engineering	178	134
Agricultural Engineering	177	133
Automobile Engineering	179	134
Civil Engineering	176	131
Computer Science and Engineering	176	131
Electrical and Electronics Engineering	176	132
Electronics and Communication Engineering	177	132
Electronics and Instrumentation Engineering	177	133
Mechanical Engineering	179	135
Mechatronics	177	133
B.Tech. Programmes		
Biotechnology	175	131
Fashion Technology	176	132
Information Technology	176	131
Textile Technology	175	131
Food Technology	175	131

11.2.1 Student Migration and Credit Transfer: Normalization of the Credits will be carried out in consultation with the Board of Studies of the programme concerned and approved by the Head of Institution, if a student migrates from other institutions to Bannari Amman Institution of Technology or rejoins from previous regulation to this regulation.

11.3 A student shall be declared to have qualified for award of B.E/B.Tech. Degree if he/she successfully completes the course requirements (vide Clause 7, 10 and 11) and passed all the prescribed courses of study of the respective programme (listed in Clause 2), within the duration specified in Clause 5.1.

12. ASSESSMENT AND AWARD OF LETTER GRADES

12.1 The assessment shall be based on the performance in the End Semester Examinations and / or Continuous Assessment, carrying marks as specified in Clause 16. Letter Grades (based on Credit Point and Grade Point) are awarded to the students based on the performance in the evaluation process.

12.2 Credit Point is the product of Grade Point and number credits for a course and Grade Point is a numerical weight allotted to each letter grade on a 10-point scale (as specified in the Clause 12.3), while the Letter Grade is an index of the performance of a student in a said course.

12.3 The performance of a student will be reported using Letter Grades, each carrying certain points as detailed below:

Range of Total Marks (as specified in Clause 16) / Specific Reason	Grade Points	Letter Grade
91 to 100	10	O (Outstanding)
81 to 90	9	A + (Excellent)
71 to 80	8	A (Very Good)
61 to 70	7	B + (Good)
50 to 60	6	B (Above average)
0 to 49	0	RA (Reappearance Registration)
Incomplete	0	I
Withdrawal	0	W
Absent	0	AB
Shortage of Attendance	0	SA

'RA' ---Reappearance registration is required for that particular course

'I' --- Continuous evaluation is required for that particular course in the subsequent examinations.

'SA' --- shortage of attendance (Clause 7) and hence prevented from writing end semester examination.

12.4 After completion of the evaluation process, Grade Point Average (GPA), and the Cumulative Grade Point Average (CGPA) is calculated using the formula:

$$GPA/CGPA = \frac{\sum_1^n C_i * g_i}{\sum_1^n C_i}$$

where

C_i : Credit allotted to the course.

g_i : Grade Point secured corresponding to the course.

n : number of courses successfully cleared during the particular semester in the case of GPA and all the semesters, under consideration, in the case CGPA.

12.5 A student who does not appear for the End Semester Examinations in a course, after registering for the same, shall be deemed to have appeared for that examination for the purpose of classification (Subject to Clause 14 and 15).

12.6 For the non credit courses Grades shall be indicated as given in the Clause 16 and shall not be counted for the computation of GPA/CGPA.

12.7 **Photocopy / Revaluation:** A student, who seeks the re-valuation of the answer script is directed to apply for the photocopy of his/her semester examination answer paper(s) in the theory course(s), within 2 working days from the declaration of results in the prescribed format to the Controller of Examinations through the Head of the Department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation through proper application to the Controller of Examinations. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses. In the case of theory courses with laboratory component, a student can seek revaluation for the theory component only, following the procedure stated above.

13. CLASSIFICATION OF THE DEGREE AWARDED

For the purpose of the 'Award of Degree', the duration of completion of the programme shall be the total duration taken by a student for completing first time registration of all the required courses and satisfying Clause 11, regardless to the period of Break-of-study as per Clause 15 and satisfy any one of the conditions required as given below.

13.1 **First Class with Distinction**: A student who qualifies for the award of the Degree having passed all the courses of study of all the Eight Semesters (six semesters for lateral entry students) at the first opportunity, after the commencement of his / her study and securing a CGPA not less than 8.50 (vide clause 12.3) shall be declared to have passed with **First Class with Distinction**.

13.2 **First Class**: A student who qualifies for the award of the Degree having passed all the courses of study of all the eight semesters (six semesters for lateral entry students) after the commencement of his / her study and securing a CGPA not less than 6.50 shall be declared to have passed with **First Class** (not exceeded the total duration as specified in the Clause 5).

13.3 **Second Class**: All other students who qualify for the award of the Degree shall be declared to have passed in **Second Class.**

13.4 Course Completion Certificate shall be given to a student, provided he / she should have registered all the courses and also registered for the examinations in those courses (subject to Clause 6.0 and 7.0).

14. WITHDRAWAL FROM THE EXAMINATION

14.1 A student may, for valid reasons, be granted permission by the Head of the Department to withdraw from appearing in the examination in any course(s) only once during the entire duration of the degree programme.

14.2 Withdrawal application shall be valid only, if the student is eligible to write the examination as per Clause 7 and, if such request for withdrawal is made prior to the submission of the Continuous Assessment marks of the course(s) with the recommendations from the Head of the Department.

14.3 Withdrawal shall not be considered as an appearance in the examination for the eligibility of a student for First Class with Distinction or First Class.

15. AUTHORIZED BREAK OF STUDY FROM A PROGRAMME

15.1 A student is permitted to go on break of study for a maximum period of one year either as two breaks of one semester each or a single break of one year.

15.2 A student is normally not permitted to break the period of study temporarily. However, if a student happens to discontinue the programme temporarily during the

middle of programme of study, for reasons such as personal accident or hospitalization due to ill health or in need of health care, he/she shall apply to the Head of the Institution in advance, in any case, not later than the last date for registering for the semester examination, through the Head of the Department stating the reasons for the break-of-study (for one academic semester or 6 months, whichever is earlier). However, a student detained for want of minimum attendance requirement as per Clause 7 shall not be considered as permitted 'Break of Study' and Clause 15.3 is not applicable for such case.

15.3 The student is permitted to rejoin the programme after the break shall be governed by the rules and regulations of DoTE and the Curriculum and Regulations in force at the time of rejoining, subject to the Clause 11.2.1.

15.4 Authorized break of study will be counted towards the duration specified for passing all the courses (vide Clause 5.1 and 5.2) and for the purpose of classification of Degree (vide Clause 13).

15.5 The total period for completion of the programme reckoned from the commencement of the first semester to which the student is admitted shall not exceed the maximum period specified in Clause 5.1, irrespective of the period of break of study in order that he / she may be eligible, for the award of the degree (vide Clause 13).

15.6 In case of valid reasons (as stated in Clause 15.2) extended break-of-study may be granted by the Head of the Institution for a period not more than one year (total duration or two semesters whichever is earlier) in addition to the earlier authorized break of study.

15.7 If a student does not report back to the Institute, even after the extended Break of Study, the name of the student shall be deleted permanently from the college enrollment. Such students are not entitled to seek readmission under any circumstances.

16. SCHEME OF ASSESSMENT

Courses offered under B.E. / B.Tech. Programmes are assessed as given below:

I	**THEORY COURSES**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Test I (15)	
	Test II (15)	
	Open book test (10)	
	Library - Seminars / Assignments (Two) (10)	
	End Semester Examination	**50**
	Total Marks	**100**

II	**THEORY COURSES WITH LAB COMPONENT**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Test I (10)	
	Test II (10)	
	Conduct of Experiment	
	Preparation(5)	
	Experiment and Results (5)	
	Record Note[#]	
	Final Lab Examination (20)	
	End Semester Examination (QP pattern as per (I))	**50**
	Total Marks	**100**

III	**LABORATORY COURSES**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Conduct of Experiment	
	i. Preparation (5)	
	ii. Experiment and Results (10)	
	iii. Record / Observation[#] *(5)*	
	Test – Cycle I (15)	
	Test – Cycle II (15)	
	End Semester Examination	
	Experiments & Results (40)	**50**
	Viva Voce – (10)	
	Total Marks	**100**

[#] *Reports / Record Note / Integrated Lab Manual to be retained for 1 year for Academic Audit, by respective Department*

IV	**TECHNICAL SEMINAR**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Presentation I (25)	
	Presentation II (25)	
	End Semester Examination	
	Report[#] (20)	**50**
	Presentation (20)	
	Viva voce (10)	
	Total Marks	**100**

V	**PROJECT**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Review I	
	Literature survey (10)	
	Problem Identification (5)	
	Methodology (10)	
	Review II	
	Continuation in Methodology (10)	
	Results / Progress (15)	
	End Semester Examination	
	Report[#] (20)	**50**
	Presentation (20)	
	Viva voce (10)	
	Total Marks	**100**

VI	**LANGUAGE ELECTIVE**	**Marks**
	(CONTINUOUS ASSESSMENT ONLY)	
	Test 1	
	Listening (10)	
	Speaking (5)	**25**
	Reading (5)	
	Writing (5)	
	Test 2	
	Listening (10)	
	Speaking (5)	**25**
	Reading (5)	
	Writing (5)	
	Oral Exam	**50**
	Total Marks	**100**

[#] *Reports / Record Note / Integrated Lab Manual to be retained for 1 year for Academic Audit, by respective Department*

VII	ONE-CREDIT COURSE	Marks
	Test	**30**
	Quiz	**20**
	Final Examination	**50**
	Total Marks	**100**

VIII	MINI-PROJECT	Marks
	(CONTINUOUS ASSESSMENT ONLY)	
	Review I	**25**
	Review II	**25**
	Project Evaluation	
	Report (25)[#]	**50**
	Presentation&Viva Voce (25)	
	Total Marks	**100**

IX	LIFE SKILLS	Marks
	(CONTINUOUS ASSESSMENT ONLY)	
	Test I	**25**
	Test II	**25**
	Final Examination	**50**
	Total Marks	**100**
	Grades (Excellent / Good / Satisfactory/Not Satisfactory)	

X	VALUE ADDED / CERTIFICATE COURSES	Marks
	(CONTINUOUS ASSESSMENT ONLY)	
	Test I	**25**
	Test II	**25**
	Final Evaluation / Test	**50**
	Total Marks	**100**
	Grades (Excellent / Good / Satisfactory / Not Satisfactory)	

XI	ENGINEERING GRAPHICS	Marks
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Class work (based on attendance) (5)	
	Assignments (Minimum 8 Assignments) (20)	
	Model Examination (25)	
	End Semester Examination	**50**
	Total Marks	**100**

[#] *Reports / Record Note / Integrated Lab Manual to be retained for 1 year for Academic Audit, by respective Department*

Optional Test: *A student becomes eligible to appear for the one optional test conducted after the Periodical Test II, only under the following circumstances: (i) absent for Test I or Test II or both on account of medical reasons (hospitalization / accident / specific illness), or (ii) participation in the College / University / State / National / International level Sports events with prior permission from the Head of the Institution and (iii) on satisfying the conditions (i) or (ii), the student should have registered for the Optional Test, through the concerned member of faculty who handles the course or through the respective Head of the Department, submitted to the Controller of Examinations. Such Optional Tests are not conducted for the courses under the categories III, IV, V, VI, VII, VIII, IX, X and XI listed above.*

17. FIELD / INDUSTRIAL VISIT / INTERNSHIP

Heads of Departments, in order to provide the experiential learning to the students, shall take efforts to arrange at least two industrial visits / field visits in a semester. The students may also undergo in-plant training / internship during summer / winter vacation between III and VII semesters.

18. PERSONALITY AND CHARACTER DEVELOPMENT

Every student shall be required to undergo a minimum of 40 hours of Personality Development Programmes viz, NSS / NCC / YRC / YOGA / Sports and Games / Technical and Non-technical Club activities during the first year, failing which he/she shall not be permitted to appear for the End Semester examinations of semester II and there onwards. Such students are permitted to appear for the End Semester examinations of semester II and there onwards only after completing satisfactorily the requirements.

The attendance of the personality and character development courses / events shall be maintained on the regular basis by the concerned First Year Co-ordinators and made available in the Office of the Controller of Examinations before the commencement of Semester examinations of Semester I or Semester II.

19. DISCIPLINE

A student is expected to follow the rules and regulations laid down by the Institute and the affiliating University, as published from time to time. Any violations, if any, shall be treated as per the procedures stated thereof.

If a student indulges in malpractice in any of the End Semester / Continuous Assessments, he / she shall be liable for punitive action as prescribed by the Institution / University from time to time.

20. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

The Institution reserves the right to revise/amend/change the Regulations, Curriculum, Syllabi, Scheme of Examinations and date of implementation and to introduce Additional Electives, Open Electives, One Credit Courses and Value Added Courses through the Academic Council.

The Question Paper pattern (Theory Examination) for UG Programme is given below:

PART A

Objective Type Questions: 20	**(20X1 = 20 Marks)**	**20**

PART B

Short Answer Questions: 10	**(10X2 = 20 Marks)**	**20**

PART C

Long Answer Questions: 5	**(5X12 = 60 Marks)**	**60**

	Total	**100**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1 Apply Computational Theory blended with Mathematics and Engineering to model, design, implement, test and maintain software systems

PEO2 Communicate effectively with team members, engage in applying technologies and lead teams in industry

PEO3 Excel in Professional development, Higher studies and Entrepreneurship related to IT

PEO4 Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs

PROGRAMME SPECIFIC OBJECTIVES (PSOs)

PSO 1 Design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

PSO 2 Identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

a. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

b. **Problem Analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. **Design/ Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

f. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of , and need for sustainable development.

h. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

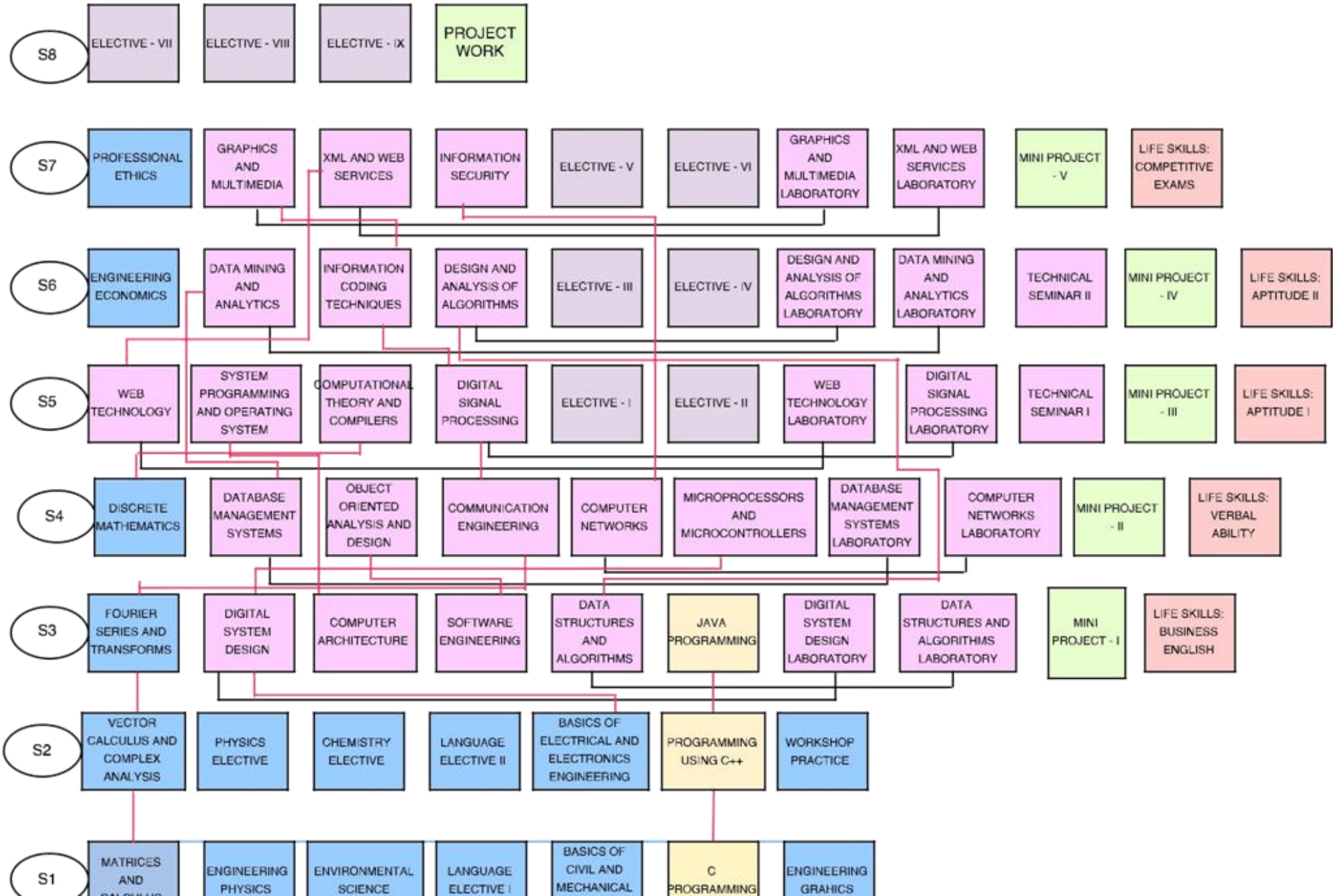
k. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l. **Life-long Learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

MAPPING of PEOs and POs

POs	a	b	c	d	e	f	g	h	i	j	k	l
PEO1	X	X	X	X	X	X				X		
PEO2		X	X	X		X		X		X	X	X
PEO3			X		X	X	X		X		X	X
PEO4	X	X			X	X		X		X	X	X

2015 REGULATION DEPARTMENT OF INFORMATION TECHNOLOGY
CONNECTIVITY CHART



B.Tech. INFORMATION TECHNOLOGY
Minimum Credits to be Earned :176

FIRST SEMESTER

Code No.	Course	Objectives & Outcomes		L	T	P	C	Maximum Marks			Category
		PEOs	POs					CA	ES	Total	
15MA101	MATRICES AND CALCULUS*	II	a,b	3	2	0	4	50	50	100	BS
15PH102	ENGINEERING PHYSICS*	II	a	2	0	2	3	50	50	100	BS
15CH103	ENVIRONMENTAL SCIENCE*	II	g	2	0	2	3	50	50	100	HSS
	LANGUAGE ELECTIVE I#	-	-	-	-	-	3	100	-	100	HSS
15GE205	BASICS OF CIVIL AND MECHANICAL ENGINEERING⊕	I, IV	a	3	0	0	3	50	50	100	ES
15GE106	C PROGRAMMING±	I, IV	a, l	3	0	2	4	50	50	100	ES
15GE207	ENGINEERING GRAPHICSλ	I, IV	a,e	0	0	4	2	50	50	100	ES
Total				**13**	**2**	**10**	**22**	**400**	**300**	**700**	-

SECOND SEMESTER

Code No.	Course	Objectives & Outcomes		L	T	P	C	Maximum Marks			Category
		PEOs	POs					CA	ES	Total	
15MA201	VECTOR CALCULUS AND COMPLEX ANALYSIS*	II	a,b	3	2	0	4	50	50	100	BS
	PHYSICS ELECTIVE*	-	-	-	-	-	4	50	50	100	BS
	CHEMISTRY ELECTIVE*	-	-	-	-	-	4	50	50	100	BS
	LANGUAGE ELECTIVE II#	-	-	-	-	-	3	100	-	100	HSS
15GE105	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERINGΔ	I, IV	a	2	0	2	3	50	50	100	ES
15IT206	PROGRAMMING USING C++®	I, IV	c, d, e	3	0	2	4	50	50	100	ES
15GE107	WORKSHOP PRACTICEΩ	I, IV	a,e	0	0	2	1	50	50	100	ES
Total				**8**	**2**	**6**	**23**	**400**	**300**	**700**	-

* Common to all branches of B.E./B.Tech
# Common to all branches of B.E./B.Tech (Continuous Assessment)
⊕ Common to CSE,ECE,EEE,EIE,FT,IT (I Semester) and to MTRS, BT,TT, FD (II Semester)
± Common to CSE,ECE,EEE,EIE,IT
λ Common to CE,CSE,ECE,EEE,EIE,IT (I Semester) and to AE, AG,AU,ME,MTRS, BT,FT,TT ,FD (II Semester)
Δ Common to AE,AG,AU,CE,ME,MTRS, BT,TT ,FD (I Semester) and to CSE,FT,IT (II Semester)
® Common to CSE and IT
Ω Common to AE, AG,AU,ME,MTRS, BT,FT,TT,FD (I Semester) and to CE,CSE,ECE,EEE,EIE,IT (II Semester)

THIRD SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	**Maximum Marks**			**Category**
		PEOs	**POs**					**CA**	**ES**	**Total**	
15MA301	FOURIER SERIES AND TRANSFORMS[α]	II	a,b	3	2	0	4	50	50	100	BS
15IT302	DIGITAL SYSTEM DESIGN	I-IV	b,c,e,g	3	2	0	4	50	50	100	ES
15IT303	COMPUTER ARCHITECTURE	I-IV	a,b,c,d,e,l	3	0	0	3	50	50	100	PC
15IT304	SOFTWARE ENGINEERING	I-IV	a,b,c,d,e,f,g,i	3	0	0	3	50	50	100	PC
15IT305	DATA STRUCTURES AND ALGORITHMS	I,III,II	a,b,c	3	0	0	3	50	50	100	PC
15IT306	JAVA PROGRAMMING	I,III,II	a,b,c	3	0	2	4	50	50	100	PC
15IT307	DIGITAL SYSTEM DESIGN LABORATORY	I-IV	b,c,e,g	0	0	2	1	50	50	100	PC
15IT308	DATA STRUCTURES AND ALGORITHMS LABORATORY	I,III,II	a,b	0	0	2	1	50	50	100	PC
15IT309	MINI PROJECT I	I,III,II	a-l	0	0	2	1	100	-	100	EEC
15GE310	LIFE SKILLS: BUSINESS ENGLISH[Φ]	I, IV	j	0	0	2	-	100	-	100	EEC
Total				**18**	**4**	**10**	**24**	**600**	**400**	**1000**	**-**
FOURTH SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	**Maximum Marks**			**Category**
		PEOs	**POs**					**CA**	**ES**	**Total**	
15MA404	DISCRETE MATHEMATICS	I,IV	a,b	2	2	0	3	50	50	100	BS
15IT402	DATABASE MANAGEMENT SYSTEMS	I-IV	a,b,c,e,g,k	3	0	0	3	50	50	100	PC
15IT403	OBJECT ORIENTED ANALYSIS AND DESIGN	I-IV	a,b,c,e,k	2	0	2	3	50	50	100	PC
15IT404	COMMUNICATION ENGINEERING	I-IV	a,b,c,d,f,g	3	0	0	3	50	50	100	ES
15IT405	COMPUTER NETWORKS	I-IV	a,d,e,g,i,j	3	0	0	3	50	50	100	PC
15IT406	MICROPROCESSORS AND MICROCONTROLLERS	I-IV	a,b,c,d,e,f	3	0	2	4	50	50	100	PC
15IT407	DATABASE MANAGEMENT SYSTEMS LABORATORY	I-IV	a,b,c,e,g,k	0	0	2	1	50	50	100	PC
15IT408	COMPUTER NETWORKS LABORATORY	I,III,II	a,d,e	0	0	2	1	50	50	100	PC
15IT409	MINI PROJECT II	I,III,II	a-l	0	0	2	1	100	-	100	EEC
15GE410	LIFE SKILLS: VERBAL ABILITY[Φ]	I, IV	j	0	0	2	-	100	-	100	EEC
Total				**16**	**2**	**12**	**22**	**600**	**400**	**1000**	**-**

[α] Common to all branches of B.E./B.Tech. except CSE
[Φ] Common to all branches of B.E./B.Tech (Non-Credit Course)

FIFTH SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	**Maximum Marks**			**Category**
		PEOs	**POs**					**CA**	**ES**	**Total**	
15IT501	WEB TECHNOLOGY	I-IV	a,c,d,e,k	3	0	0	3	50	50	100	PC
15IT502	SYSTEM PROGRAMMING AND OPERATING SYSTEMS	I-IV	a,b,c,e,k	3	0	2	4	50	50	100	PC
15IT503	COMPUTATIONAL THEORY AND COMPILERS	I-IV	a,b,c,d,e,f	3	2	0	4	50	50	100	PC
15IT504	DIGITAL SIGNAL PROCESSING	I-IV	a,b,c,d,e,f	3	0	0	3	50	50	100	ES
	ELECTIVE I	-	-	-	-	-	3	50	50	100	PE
	ELECTIVE II	-	-	-	-	-	3	50	50	100	PE
15IT507	WEB TECHNOLOGY LABORATORY	I-IV	c,d,e,k,l	0	0	2	1	50	50	100	PC
15IT508	DIGITAL SIGNAL PROCESSING LABORATORY	I,III,II	a,b,c,e	0	0	2	1	50	50	100	ES
15IT509	TECHNICAL SEMINAR I	I-IV	d,f,j,k	0	0	2	1	50	50	100	EEC
15IT510	MINI PROJECT III	I-IV	a-l	0	0	2	1	100	-	100	EEC
15GE511	LIFE SKILLS: APTITUDE I[Φ]	I,IV	a,b	0	0	2	-	100	-	100	EEC
Total				**12**	**2**	**12**	**24**	**650**	**450**	**1100**	
SIXTH SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	Maximum Marks			
		PEOs	**POs**					**CA**	**ES**	**Total**	**Category**
15GE701	ENGINEERING ECONOMICS[$]	II	a,f,g,k,l	3	0	0	3	50	50	100	HSS
15IT602	DATA MINING AND ANALYTICS	I-IV	a,c,d,f,k	3	0	0	3	50	50	100	PC
15IT603	INFORMATION CODING TECHNIQUES	I-IV	a,b,c,g,k	3	2	0	4	50	50	100	ES
15IT604	DESIGN AND ANALYSIS OF ALGORITHMS	I-IV	a,c,d,f	3	0	0	3	50	50	100	PC
	ELECTIVE III	-	-	-	-	-	3	50	50	100	PE
	ELECTIVE IV	-	-	-	-	-	3	50	50	100	PE
15IT607	DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY	I-IV	a,d,e,f	0	0	2	1	50	50	100	PC
15IT608	DATA MINING AND ANALYTICS LABORATORY	I-IV	a,c,e,f	0	0	2	1	50	50	100	PC
15IT609	TECHNICAL SEMINAR II	I-IV	a,d,f,j	0	0	2	1	50	50	100	EEC
15IT610	MINI PROJECT IV	I-IV	a-l	0	0	2	1	100	-	100	EEC
15GE611	LIFE SKILLS: APTITUDE II[Φ]	I,IV	a,b	0	0	2	-	100	-	100	EEC
Total				**12**	**2**	**10**	**23**	**650**	**450**	**1100**	**-**

[Φ] Common to all branches of B.E./B.Tech (Non-Credit Course)

[$] Common to CSE,ECE,EEE,EIE,IT (VI Semester) and to AE, AG,AU,CE,ME,MTRS,BT,FT,TT, FD (VII Semester)

SEVENTH SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	Maximum Marks			
		PEOs	**POs**					**CA**	**ES**	**Total**	**Category**
15GE601	PROFESSIONAL ETHICS[+]	II	f,g,h	2	0	0	2	50	50	100	HSS
15IT702	GRAPHICS AND MULTIMEDIA	I-IV	a,c,e,g,i,j,k	3	0	0	3	50	50	100	PC
15IT703	XML AND WEB SERVICES	I-IV	a,b,c,e,f,g,i,j,k,l	3	0	0	3	50	50	100	PC
15IT704	INFORMATION SECURITY	I-IV	a,b,c,f,g,h	3	0	0	3	50	50	100	PC
	ELECTIVE V	-	-	-	-	-	3	50	50	100	PE
	ELECTIVE VI	-	-	-	-	-	3	50	50	100	PE
15IT707	GRAPHICS AND MULTIMEDIA LABORATORY	I-IV	a,b,c,e,i,k	0	0	2	1	50	50	100	PC
15IT708	XML AND WEB SERVICES LABORATORY	I,III,II	a,b,c,e	0	0	2	1	50	50	100	PC
15IT709	MINI PROJECT V	I-IV	a-l	0	0	2	1	100	-	100	EEC
15GE710	LIFE SKILLS : COMPETITIVE EXAMS[Φ]	I,II,III	a,b,l	0	0	2	-	100	-	100	EEC
Total				**11**	**0**	**8**	**20**	**600**	**400**	**1000**	**-**
EIGHT SEMESTER											
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**	Maximum Marks			
		PEOs	**POs**					**CA**	**ES**	**Total**	**Category**
	ELECTIVE VII	-	-	-	-	-	3	50	50	100	PE
	ELECTIVE VIII	-	-	-	-	-	3	50	50	100	PE
	ELECTIVE IX	-	-	-	-	-	3	50	50	100	PE
15IT804	PROJECT WORK	I-IV	a-l	-	-	-	9	50	50	100	EEC
Total				**-**	**-**	**-**	**18**	**200**	**200**	**400**	**-**

[+] Common to AE, AU, CE, ME,MTRS, BT,FT,TT, FD (VI Semester) and to CSE,ECE,EEE,EIE,IT (VII Semester)

[Φ] Common to all branches of B.E./B.Tech (Non-Credit Course)

Electives							
Code No.	**Course**	**Objectives & Outcomes**		**L**	**T**	**P**	**C**
		PEOs	**POs**				
LANGUAGE ELECTIVES							
15LE101	BASIC ENGLISH I	II	j	3	0	0	3
15LE102	COMMUNICATIVE ENGLISH I	II	j	3	0	0	3
15LE201	BASIC ENGLISH II	II	j	3	0	0	3
15LE202	COMMUNICATIVE ENGLISH II	II	j	3	0	0	3
15LC203	CHINESE	II	j	3	0	0	3
15LF203	FRENCH	II	j	3	0	0	3
15LG203	GERMAN	II	j	3	0	0	3
15LH203	HINDI	II	j	3	0	0	3
15LJ203	JAPANESE	II	j	3	0	0	3
PHYSICS ELECTIVES							
15PH201	PHYSICS OF MATERIALS	I	a	3	0	2	4
15PH202	APPLIED PHYSICS	I	a	3	0	2	4
15PH203	MATERIALS SCIENCE	I	a	3	0	2	4
15PH204	PHYSICS OF ENGINEERING MATERIALS	I	a	3	0	2	4
15PH205	SOLID STATE PHYSICS	I	a	3	0	2	4
CHEMISTRY ELECTIVES							
15CH201	ENGINEERING CHEMISTRY	I	a	3	0	2	4
15CH202	APPLIED CHEMISTRY	I	a	3	0	2	4
15CH203	APPLIED ELECTROCHEMISTRY	I	a	3	0	2	4
15CH204	INDUSTRIAL CHEMISTRY	I	a	3	0	2	4
15CH205	WATER TECHNOLOGY AND GREEN CHEMISTRY	I	a	3	0	2	4
DISCIPLINE ELECTIVES							
15IT001	SOFTWARE TESTING METHODS AND TOOLS	I-IV	a,c,e,j,k	3	0	0	3
15IT002	C# and .NET	I-IV	a,c,d,e,i,k	3	0	0	3
15IT003	SOFTWARE QUALITY MANAGEMENT	I-IV	b,c,k	3	0	0	3
15IT004	REAL TIME SYSTEMS	I,II,III	b,c	3	0	0	3
15IT005	PARALLEL PROCESSING	I-IV	a,b,c,i	3	0	0	3
15IT006	BIG DATA ANALYTICS	I-IV	a,b,d,e,g,l	3	0	0	3
15IT007	DISASTER MANAGEMENT	I-IV	b,f,k	3	0	0	3
15IT008	MANAGEMENT INFORMATION SYSTEMS	I-IV	a,b,c,d,e,g,i	3	0	0	3
15IT009	NATURAL LANGUAGE PROCESSING	I-IV	a,b,c,f	3	0	0	3

15IT010	DIGITAL IMAGE PROCESSING	I-IV	a,b,c,d,e,f,g,h,i,j,k,l	3	0	0	3
15IT011	UNIX INTERNALS	I,II,III	b,c	3	0	0	3
15IT012	MOBILE TECHNOLOGIES	I,II,III	b,c	3	0	0	3
15IT013	OPEN SOURCE SYSTEMS	I-IV	b,c,d,e,f,g,h,j	3	0	0	3
15IT014	BIOINFORMATICS	I-IV	a,b,c,f	3	0	0	3
15IT015	JAVA FRAMEWORKS	I-IV	a,b,c,e,g	3	0	0	3
15IT016	ARTIFICIAL INTELLIGENCE	I-IV	a,b,c,d,e,f,g,h	3	0	0	3
15IT017	USER INTERFACE DESIGN	I-IV	a,b,c,d,e,k	3	0	0	3
15IT018	3D GAME PROGRAMMING	I-IV	b,c,e,k	3	0	0	3
15IT019	ANIMATION FOR COMPUTER GRAPHICS	I-IV	a,c,e,k	3	0	0	3
15IT020	USABILITY ENGINEERING	I-IV	a,b,d,e,g,l	3	0	0	3
15IT021	E-COMMERCE	I-IV	d,e,f,k,l	3	0	0	3
15IT022	ENTERPRISE RESOURCE PLANNING	I-IV	a,c,e,f,g,i,l	3	0	0	3
15IT023	COMPREHENSION	I-IV	a,g	3	0	0	3
15IT024	INFORMATION STORAGE MANAGEMENT	I,III,II	a,b,d,e	3	0	0	3
15IT025	CLOUD INFRASTRUCTURE SERVICES	I-IV	b,e,f,g	3	0	0	3
15IT026	ENTERPRISE RESOURCE PLANNING - BUSINESS APPLICATION PROGRAMMING I	I,III,II	a,b,c,d,e	3	0	0	3
15IT027	ENTERPRISE RESOURCE PLANNING - BUSINESS APPLICATION PROGRAMMING II	I-IV	b,c,d,e,f,g	3	0	0	3
15IT028	CLOUD COMPUTING	I-IV	a,c,d,e,f	3	0	0	3
15IT029	CLOUD MANAGEMENT ESSENTIALS	I-IV	c,g	3	0	0	3
15IT030	ENTERPRISE SYSTEM PROGRAMMING	I,III,II	a,c,d	3	0	0	3
15IT031	UI UX DESIGN AND PROGRAMMING	I,III,II	a,c,e	3	0	0	3
15IT032	NETWORKING ESSENTIALS	I,III,II,IV	a,c,d,e,g,h,k,m	3	0	0	3
15IT033	MACHINE LEARNING	I,III,II,IV	a,b,c,d,e,f	3	0	0	3
15IT034	LINUX ADMINISTRATION	I,III,II	a,c,e,m	3	0	0	3
15IT035	STREAMING ANALYTICS	I,II,III,IV	c,d,e,h	3	0	0	3
15IT036	HIGH PERFORMANCE COMPUTING	I,III,II	a,b,c,m,n	3	0	0	3
15IT037	SOCIAL NETWORK ANALYTICS	I,III,II,IV	a,b,d,e,f,i,j	3	0	0	3
15IT039	STORAGE MANAGEMENT ESSENTIALS	I,III,II,IV	a,b,c,d,e,f,g,k,m,n	3	0	0	3
15IT040	ENTERPRISE DATA MANAGEMENT	I,II,III	b,c,d	3	0	0	3
15IT041	ENTERPRISE SYSTEMS SECURITY AND FORENSICS	I,III,II,IV	a,b,c,d,e,h	3	0	0	3
PHYSICAL SCIENCE ELECTIVES							
15GE0P1	NANOMATERIALS SCIENCE	I,II	a	3	0	0	3
15GE0P2	SEMICONDUCTOR PHYSICS AND DEVICES	I,II	a	3	0	0	3
15GE0P3	APPLIED LASER SCIENCE	I,II	a	3	0	0	3

15GE0C1	CORROSION SCIENCE	I,II	a	3	0	0	3
15GE0C2	ENERGY STORING DEVICES AND FUEL CELLS	I,II	a	3	0	0	3
15GE0C3	POLYMER CHEMISTRY AND PROCESSING	I,II	a	3	0	0	3
OPEN ELECTIVES							
15IT0YA	DATABASE MANAGEMENT SYSTEMS	I-IV	e,j,k,l	3	0	0	3
15IT0YB	DATA STRUCTURES AND ALGORITHMS	I,II,III	c,d	3	0	0	3
15IT0YC	DATA SCIENCES AND ANALYTICS	I,III,II	a,c,d	3	0	0	3
15IT0YD	OBJECT ORIENTED PROGRAMMING	I-IV	b,c,e,k	3	0	0	3
15IT0YE	ARTIFICIAL INTELLIGENCE	I,III,II,IV	a,b,c,d,e,f,i,j,n	3	0	0	3
15IT0YF	COMPUTATIONAL INTELLIGENCE	I,III,II,IV	a,b,c,d,e,j,n	3	0	0	3
15IT0YG	CYBER FORENSICS	I,III,II,IV	a,b,c,d,e,f,g,h,i,j,k,l,m,n	3	0	0	3
15IT0YH	DATABASE PROGRAMMING	I,III,II	a,b,c,e,m,n	3	0	0	3
15IT0YI	CLOUD ARCHITECTURE AND MANAGEMENT	I-IV	a,b,c,d,e,m	3	0	0	3
15IT0YJ	LINUX STSTEM ADMINISTRATION	I,III,II	a,b,c,m	3	0	0	3
ONE CREDIT COURSES							
15IT0XA	ANDROID APPLICATION DEVELOPMENT	I - IV	b,c,e,l	-	-	-	1
15IT0XB	PYTHON ESSENTIALS	I,III,II	a,c,d	-	-	-	1
15IT0XC	PERL PROGRAMMING	I - IV	c,e,l	-	-	-	1
15IT0XD	GOOGLE APP SCRIPTING	I - IV	b,c,e,l	-	-	-	1
15IT0XE	CONTAINERIZING OPENSTACK SERVICES	I,II,III	c	-	-	-	1
15IT0XF	FLASK	I,III,II,IV	a,c,e,f,g	-	-	0	1
15IT0XG	ANGULAR JS	I,III,II	a,b,c,d	-	-	-	1
15IT0XH	GRAPHICS DESIGN USING CORALDRAW	I,II,III	e	-	-	-	1
15IT0XK	WEB APPLICATION USING WORDPRESS	I,III,II	a,e	-	-	-	1
ADDITIONAL ONE CREDIT COURSES (I to III Semesters)							
15GE0XA	HEALTH AND FITNESS	-	-	-	-	-	1
15GE0XB	FOUNDATION COURSE IN COMMUNITY RADIO TECHNOLOGY	-	-	-	-	-	1
15GE0XC	VEDIC MATHEMATICS	-	-	-	-	-	1
15GE0XD	INTRODUCTION TO ALGORITHMS	-	-	-	-	-	1
15GE0XE	ETYMOLOGY	-	-	-	-	-	1
15GE0XF	HINDUSTANI MUSIC	-	-	-	-	-	1
15GE0XG	CONCEPT, METHODOLOGY AND APPLICATIONS OF VERMICOMPOSTING	-	-	-	-	-	1
15GE0XH	AGRICULTURE FOR ENGINEERS	-	-	-	-	-	1
15GE0XI	INTRODUCTION TO DATA ANALYSIS USING SOFTWARE	-	-	-	-	-	1

15GE0XJ	ANALYSIS USING PIVOT TABLE	-	-	-	-	-	1

SUMMARY OF CREDIT DISTRIBUTION

S.No	CATEGORY	CREDITS PER SEMESTER								TOTAL CREDIT	CREDITS in %	Range of Total Credits	
		I	II	III	IV	V	VI	VII	VIII			Min	Max
1	BS	7	12	4	3					26	14.77%	15%	20%
2	ES	9	8	4	3	4	4			32	18.18%	15%	20%
3	HSS	6	3				3	2		14	7.9%	5%	10%
4	PC			15	15	12	8	11		61	34.65%	30%	40%
5	PE					6	6	6	9	27	16.34%	10%	15%
6	EEC			1	1	2	2	1	9	16	9.09%	10%	15%
Total		22	23	24	22	24	23	20	18	176	100%	-	-

BS - Basic Sciences
ES - Engineering Sciences
HSS - Humanities and Social Sciences
PC - Professional Core
PE - Professional Elective
EEC - Employability Enhancement Course

CA - Continuous Assessment
ES - End Semester Examination

15MA101 MATRICES AND CALCULUS 3 2 0 4

Course Objectives

- Interpret the introductory concepts of Matrices and Calculus, which will enable them to model and analyze physical phenomena involving continuous changes of variables
- Summarize and apply the methodologies involved in solving problems related to fundamental principles of Matrices and Calculus.
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Analyze the characteristics of a linear system with eigen values and vectors.
2. Identify and model the real time problem using first order linear differential equations.
3. Recognize and solve the higher order ordinary differential equations.
4. Characterize the functions and get the solutions of the same.
5. Evaluate the functions to get the surface area and volume using multiple integral.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2		1										
2	3	1		2										
3	2	1												
4	3	2												
5		3		1										

UNIT I **9 Hours**

MATRICES

Eigen Values and Eigen Vectors of a real matrix - Properties of Eigen Values-Stretching of elastic membranes. Cayley - Hamilton Theorem - Quadratic form: Reduction of a quadratic form to a canonical form.

UNIT II **8 Hours**

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER

Leibnitz's Equations - Modelling and solutions using Newtons law of cooling of bodies - solutions to R-L and R-C electric circuits.

UNIT III **11 Hours**

ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Linear differential equations of second and higher order with constant coefficients. Linear differential equations of higher order with variable coefficients: Cauchys linear differential equation - Method of variation of parameters for second order differential equations.

UNIT IV **9 Hours**

MULTIVARIABLE CALCULUS

Functions of Two Variables and their solutions- Total Differential - Derivative of implicit functions- Jacobians Unconstrained maxima and minima.

UNIT V **8 Hours**

MULTIPLE INTEGRALS

Double integration with constant and variable limits-Region of integration -Change the order of integration -Area as double integral in cartesian coordinates. Triple integral in Cartesian coordinates.

FOR FURTHER READING

Applications of mass spring system in ordinary differential equations of higher order

Total: 75 Hours

Reference(s)

1. C. Ray Wylie and C Louis Barrett, Advanced Engineering Mathematics, Sixth Edition, Tata McGraw-Hill Publishing Company Ltd, 2003.
2. Erwin Kreyszig , Advanced Engineering Mathematics, Tenth Edition, Wiley India Private Limited,New Delhi 2015.
3. Peter V. O Neil , Advanced Engineering Mathematics, Seventh Edition , Cengage Learning India Private Limited, 2012.
4. B.S. Grewal, Higher Engineering Mathematics, Forty Third Edition, Khanna Publications , New Delhi 2014.
5. Glyn James, Advanced Engineering Mathematics, Third Edition,Wiley India, 2014.
6. T.Veerarajan, Engineering mathematics for First Year,Tata McGraw-Hill Publishing company Limited, New Delhi, 2014.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2					6					6			6											20
2	2					2				4					4				6						18
3		2			2						6			6					6						22
4		2					6				8				6										22
5	2						4			6									6						18
Total																									100

Assessment Questions

Remember

1. State Cayley - Hamilton theorem.
2. List out five natures of a quadratic form.
3. Define spectral values of a matrix.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Assignments / ASS 10	10
Attendance / Att 5	5
Innovative Practices / IP 5	5

15PH102 ENGINEERING PHYSICS 2 0 2 3

Course Objectives

- To impart knowledge in properties of matter, crystallography and ultrasonics
- To understand the applications of lasers and fiber optics
- To implement the principles of quantum physics in the respective engineering fields

Programme Outcomes (POs)

Course Outcomes (COs)

1. Analyze the concept of properties of matter and apply the same for practical applications
2. Identify the suitable laser source for fiber optic communication applications
3. Analyze the properties of ultrasonic waves and apply the same for day today applications
4. classify the different types of crystal structures and analyze their properties
5. Apply the Schrodinger wave equation to illustrate the motion of quantum particles

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		3	2											
2	1	2	3				1							
3		3	1					2						
4	1	2						1						
5		2	3											

UNIT I **8 Hours**

PROPERTIES OF MATTER

Elasticity: elastic and plastic materials - Hooke's law - elastic behavior of a material -stress -strain diagram- factors affecting elasticity. Three moduli of elasticity- Poisson's ratio-torsional pendulum-twisting couple on a cylinder. Young's modulus- uniform bending -non- uniform bending. Viscosity: coefficient of viscosity -streamline and turbulent flow -experimental determination of viscosity of a liquid -Poiseuille's method.

UNIT II **6 Hours**

APPLIED OPTICS

Interference: air wedge- theory- uses- testing of flat surfaces- thickness of a thin wire. Laser: introduction- principle of laser- characteristics of laser- types: CO2 laser -semiconductor laser (homo junction). Fiber optics: principle of light transmission through fiber- expression for acceptance angle and numerical aperture- types of optical fibers (refractive index profile and mode)- fiber optic communication system (block diagram only).

UNIT III **5 Hours**

ULTRASONICS

Ultrasonics: introduction- properties of ultrasonic waves-generation of ultrasonic waves-magnetostriction- piezo electric methods- detection of ultrasonic waves. Determination of velocity of ultrasonic waves (acoustic grating). Applications of ultrasonic waves: SONAR- measurement of velocity of blood flow -study of movement of internal organs.

UNIT IV **5 Hours**

SOLID STATE PHYSICS

Crystal Physics: lattice -unit cell -crystal systems- Bravais lattices- Miller indices- 'd' spacing in cubic lattice- calculation of number of atoms per unit cell, atomic radius, coordination number and packing density for SC, BCC, FCC and HCP structures- X-ray diffraction: Laue's method - powder crystal method.

UNIT V **6 Hours**

QUANTUM MECHANICS

Quantum Physics: development of quantum theory- de Broglie wavelength -Schrodinger's wave equation- time dependent and time independent wave equations- physical significance. Application: particle in a box (1d)- degenerate and non-degenerate states. Photoelectric effect: quantum theory of light work function- problems.

FOR FURTHER READING

Neutrions - expanding universe

1 **2 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 1

Determine the moment of inertia of the disc and calculate the rigidity modulus of a given wire using torsion pendulum (symmetrical masses method).

3 **4 Hours**

EXPERIMENT 2

Find the elevation of the given wooden beam at the midpoint by loading at the ends and hence calculate the Youngs modulus of the material.

4 **4 Hours**

EXPERIMENT 3

Find the depression at the midpoint of the given wooden beam for 50g, 100 g, 150 g, 200 g and 250 g subjected to non-uniform bending and determine the Youngs modulus of the material of the beam.

5 **4 Hours**

EXPERIMENT 4

Determine the coefficient of viscosity of the given liquid by Poiseulles method.

6 **4 Hours**

EXPERIMENT 5

Form the interference fringes from the air wedge setup and calculate the thickness of the given wire.

7 **4 Hours**

EXPERIMENT 6

By applying the principle of diffraction, determine the wavelength of given laser and the average particle size of lycopodium powder using laser source.

8 **4 Hours**

EXPERIMENT 7

Determine the
(i) wavelength of ultrasonics in a liquid medium,
(ii) velocity of ultrasonic waves in the given liquid
(iii) compressibility of the given liquid using ultrasonic interferometer.

Total: 60 Hours

Reference(s)

1. D. S. Mathur, Elements of Properties of Matter, 5th edition, S Chand & Company Ltd., New Delhi, 2012.
2. Charles Kittel, Introduction to Solid State Physics, 8th edition, Wiley India Pvt. Ltd., New Delhi, 2012.
3. Arthur Beiser, Shobhit Mahajan and S Rai Choudhury, Concepts of Modern Physics, 6th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
4. B. K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt. Ltd., New Delhi, 2012.
5. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
6. Ian Morison, Introduction to Astronomy and Cosmology, John Wiley and Sons, Ltd., 2013.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	2				4	2				6				4				4						24
2		2				2	6			2	4			4											20
3		4				4	2			4				2				2							18
4	2	2				4					6			2				2							18
5	2	2				4	4			4					4										20
Total																									100

Assessment Questions

Remember

1. Reproduce Hooke's law
2. Name the three types of moduli of elasticity
3. List the two applications of air wedge
4. Recall the two conditions required for achieving total internal reflection
5. Define magnetostriction effect
6. Recognize the four applications of ultrasonics in medical field
7. Write the Bragg's condition necessary for obtaining X-ray diffraction in crystals
8. Retrieve the seven types of crystal system
9. Recall four physical significance of wave function
10. Define photoelectric effect

Understand

1. Explain the procedure adopted for determining the Young's modulus of the given material by non-uniform bending method
2. Illustrate the effect of temperature on elasticity of a material
3. Classify the fiber optics based on refractive index profile
4. Indicate the role of optical resonators in the production of laser
5. Compare the merits of magnetostriction and piezo-electric oscillators
6. Summarize the four applications of ultrasonic waves in day-today life
7. Identify the closely packed cubic crystal structure with an example
8. Compare Laue method and powder crystal method used in X-ray diffraction

9. Infer the significance of photoelectric effect
10. Represent the two assumptions involved in solving the Schrödinger time dependent wave equation

Apply

1. Show that when a cylinder is twisted the torsional couple depends on torsional rigidity
2. Using torsional pendulum, explain the rigidity modulus of the wire
3. Design an experimental setup used for determining the thickness of a thin material
4. A silica optical fiber has a core refractive index of 1.50 and a cladding refractive index of 1.47. Find the numerical aperture for the fiber.
5. Construct the piezo electric oscillator circuit and explain the generation of ultrasonic waves
6. Find the depth of submerged submarine if an ultrasonic wave is received after 0.33 s from the time of transmission.(given v=1400 m/s)
7. Show that the axial ratio for an ideal HCP structure is 1.633
8. Sketch the planes having Miller indices (100) and (111).
9. Assess the various energy levels of an electron enclosed in a one dimensional potential well of finite width ‘a’
10. Compute the relation between de Broglie wavelength and velocity of a particle

Analyse

1. Differentiate uniform bending from non-uniform bending
2. Straight lined fringes are formed only in flat glass plates. Justify.
3. Conclude that the thickness of thin wire is influenced by band width of a material
4. Outline the merits and demerits of magnetostriction oscillator method.
5. Five fold symmetry is not possible in crystal structures. Justify your answer.
6. Compare the degenerate state with non-degenerate state

Evaluate

1. Determine the viscosity of a given liquid using Poiseuille’s method (Given: water, burette, stop clock, capillary tube, stand and travelling microscope)
2. When ultrasonic waves are passed through liquids, cavitations are produced. Criticize the statement
3. Check the packing factor for a simple cubic structure is 0.52

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15CH103 ENVIRONMENTAL SCIENCE 2 0 2 3

Course Objectives

- Realize the interdisciplinary and holistic nature of the environment
- Understand how natural resources and environment affect the quality of life and stimulate the quest for sustainable development
- Recognize the socio-economic, political and ethical issues in environmental science

Programme Outcomes (POs)

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. Assess the importance of interdisciplinary nature of environment studies, uses and exploitation of natural resources.
2. Analyze the different types of ecosystems and biodiversity, its values and also role of professionals in protecting the environment from degradation.
3. Identify the existing environmental challenges related to pollution and its management.
4. Select suitable strategies for sustainable management of components of environmental.
5. Correlate the impacts of population and human activities on environment.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2		2												
3			3			3	1							
4			2			1	3							
5			2			2	2							

UNIT I **6 Hours**

NATURAL RESOURCES

Forest resources: Use - over exploitation - deforestation - case studies. Water resources: Use - over utilization of surface and ground water - conflicts over water. Mineral resources: Use - exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources: Effects of modern agriculture - fertilizer-pesticide problems (eutrophication, blue baby syndrome, biomagnification) - water logging - salinity - case studies. Energy resources: renewable(solar, wind, tidal, geothermal and hydroelectric power) - non renewable energy sources

UNIT II **6 Hours**

ECOSYSTEMS AND BIODIVERSITY

Concept of an ecosystem: Structure and function of an ecosystem - producers - consumers - decomposers - food chains - food webs and ecological pyramids - Types of ecosystem: Introduction - characteristic features: forest ecosystem - desert ecosystem - ecological succession. Biodiversity - value of biodiversity - threats to biodiversity - endangered and endemic species - Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity - field study

UNIT III **6 Hours**

ENVIRONMENTAL POLLUTION

Pollution: Definition - causes - effects - control measures of air pollution - water pollution : (Sewage water treatment by activated sludge and trickling filter process) - marine pollution - thermal pollution - noise pollution. Disaster management: causes - effects - control measures of floods - earthquake - cyclone - landslides

UNIT IV **7 Hours**

SOCIAL ISSUES AND ENVIRONMENT

Sustainable development : Definition - Unsustainable to sustainable development - urban problems related to energy. Environmental ethics - issues and possible solutions - solid waste management - causes - effects - 3R Principles (landfills, incineration, composting). Water conservation - rain water harvesting - watershed management. Climate change - global warming - acid rain - ozone layer depletion. Environment protection act: Air (Prevention and control of pollution) act - wildlife protection act

UNIT V **5 Hours**

HUMAN POPULATION AND ENVIRONMENT

Human population: Population growth - characteristics - variation among nations - population explosion - women and child welfare programmes - value education - HIV / AIDS. Role of information technology in environment and human health - occupational safety and health administration (OSHA)

FOR FURTHER READING

Human rights:E - waste and biomedical waste -Identification of adulterants in food materials

1 **2 Hours**

EXPERIMENT 1

General instructions to students for handling the reagents and safety precautions.

2 **4 Hours**

EXPERIMENT 2

Estimation of dissolved oxygen in a water sample/sewage by Winklers method

3 **4 Hours**

EXPERIMENT 3

Estimation of chloride content in water by argentometric method

4 **4 Hours**

EXPERIMENT 4

Estimation of calcium in lime by complexometric method

5 **4 Hours**

EXPERIMENT 5

Estimation of chromium in leather tannery effluents

6 **4 Hours**

EXPERIMENT 6

Determination of percentage purity of washing soda

7 **4 Hours**

EXPERIMENT 7

Estimation of heavy metals in the given solution by EDTA method

8 **4 Hours**

EXPERIMENT 8

Determination of Prussian blue dye concentration by spectrophotometer

Total: 60 Hours

Reference(s)

1. Anubha Kaushik, C.P. Kaushik, Environmental Science and Engineering , 4th Multi Colour Edtion, New Age International Publishers, New Delhi, 2014
2. A. Ravikrishnan, Environmental Science and Engineering, 5th revised Edition, Sri Krishna Hitech Publishing company (P) Ltd, Chennai, 2010
3. T. G. Jr. Miller, S. Spoolman, New Environmental Science, 14th Edition, Wadsworth Publishing Co, New Delhi, 2014
4. E. Bharucha, Textbook of Environmental studies, second Edition, Universities Press Pvt. Ltd., New Delhi, 2013
5. A. K. De, Environmental Chemistry, 7th Edition , New age international publishers, New Delhi, 2014

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	3	3			4	5				1			1	3											20
2	4	1			5	7							1	2											20
3	3				4	6	2		1	1			1	1				1							20
4	1	2			3	8	1			4			2	4											25
5	1	2			2	5				1			1	2				1							15
Total																									100

Assessment Questions

Remember

1. Define the term bio-magnification.
2. Name any four major gases responsible for air pollution.
3. Recall four gases responsible for greenhouse effect.
4. State environmental ethics.
5. List any two impacts of water pollution.
6. Mention the two objectives of value education.
7. List any four consequences of air pollution on human health.
8. Recall any two endangered and endemic species of India.
9. List any two disadvantages of nuclear energy production.

Understand

1. Summarize the structural and functional attributes of an ecosystem.
2. With the help of neat flow chart explain waste water treatment process using activated sludge process.
3. Explain the modern method of rain water harvesting technique diagrammatically and discuss the various strategies adopted for water conservation.
4. Summarize the abstracts of Wildlife (protection) Act, 1972.
5. Indicate the three consequences of noise pollution.
6. Classify the ecosystems on the basis of energy sources
7. Infer two types of photochemical reactions involved in formation and destruction of ozone in the stratosphere.
8. Explain how the impacts of natural disasters can be minimized on human communities with on representative example.
9. Summarize four major effects caused on forests and tribal people due to big dam construction.
10. Infer the any two conflicts over water, confining to our nation.
11. Identify three major threats to Indian biodiversity
12. Relate the concept of food chain and food web with tropic level and mention their three significances.

Apply

1. Identify any seven impacts caused if ground water is used enormously.
2. Select the proper disaster management techiques that can be implemented to manage. a) Earthquake b) Floods
3. Summarize the concept age-structure pyramids as a tool to achieve stabilized population in our nation.
4. Predict the significances of child welfare programmes in India.
5. Implement the 3R approach to manage solid waste.
6. Assess the four adverse effects of solid waste.
7. Assess how climate change affects human health.

Analyse

1. Differentiate between confined and unconfined aquifers.
2. Distinguish between critical and strategic minerals with two examples for each.
3. Outline variations in population growth among nations with necessary diagram.
4. “Day by day our atmosphere gets prone to serious effects” and “deterioration of environment affects human health”. Justify these two statements.
5. Compare the major two advantages and limitations of major greenhouse pollutant CO2.

Evaluate

1. Choose any one suitable method to minimize the impact of acid rain on environment.
2. Determine the doubling time of population, if annual growth rate of a nation is 25 years.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15GE205 BASICS OF CIVIL AND MECHANICAL ENGINEERING

3 0 0 3

Course Objectives

- To impart basic knowledge in the field of Civil Engineering
- To guide students to select the good building materials
- To create awareness on various types of water supply and transportation systems
- To impart basic knowledge in the various engineering materials and manufacturing Processes.
- To understand the working principles of various Internal Combustion Engines, Refrigeration, Boiler and power plants.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Illustrate the concepts and fundamental philosophies of Civil Engineering.
2. Classify the components of building with its functions and material qualities.
3. Explain the sources of water supply and transportation systems.
4. Identify various engineering materials and manufacturing processes.
5. Classify the working principles and operations of Internal Combustion Engines and Refrigeration cycles.
6. Identify different Energy sources and classify types of boilers, turbine and power plants.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2												
2			3											
3		2												
4			2											
5		3												
6	2													

UNIT I **7 Hours**

INTRODUCTION TO CIVIL ENGINEERING

History, development and scope of Civil Engineering Functions of Civil Engineers.Construction Materials Characteristics of good building materials such as Stones Bricks -Cement - Aggregates and concrete. Surveying: Definition and purpose Classification Basic principles Measurement of length by chains and tapes.

UNIT II **7 Hours**

GENERAL FEATURES RELATING TO BUILDINGS

Selection of site Basic functions of buildings Major components of buildings. Types of foundation Bearing capacity of soils General Principles of Brick masonry Stone masonry Beams Lintels Columns Doors and windows Introduction to Green Building and Interior Design

UNIT III **7 Hours**

WATER SUPPLY AND TRANSPORTATION SYSTEMS

Sources of water Supply Methods of Rain Water Harvesting Flow Diagram of Water treatment Process Modes of Transportation Systems. Classification of Highways-Components of roads Bituminous and cement concrete roads. Importance of railways - Gauges Components of permanent way Types of bridges.

UNIT IV **8 Hours**

ENGINEERING MATERIALS AND MANUFACTURING PROCESSES

Materials classification, mechanical properties of cast iron, steel and high speed steel Casting process-Introduction to green sand moulding, pattern, melting furnace electric furnace Introduction to metal forming process and types Introduction to arc and gas welding Centre lathe, Drilling and Milling machines principal parts, operations.

UNIT V **8 Hours**

INTERNAL COMBUSTION ENGINES AND REFRIGERATION

Internal Combustion (IC) Classification, main components, working principle of a two and four stroke petrol and diesel engines, differences Refrigeration working principle of vapour compression and absorption system Introduction to Air conditioning.

UNIT VI **8 Hours**

ENERGY, BOILERS, TURBINE AND POWER PLANTS

Energy-Solar,Wind,Tidal,Geothermal,Biomass and Ocean Thermal Energy Conversion (OTEC)Boilers classification, Babcock and Wilcox and La-Mont Boilers, differences between fire tube and water tube boiler Steam turbines- working principle of single stage impulse and reaction turbines Power plant classification, Steam, Hydel, Diesel, and Nuclear power plants.

Total: 45 Hours

Reference(s)

1. N. Arunachalam, Bascis of Civil Engineering, Pratheeba Publishers, 2000
2. M. S. Palanichamy, Basic Civil Engineering, TMH, 2009
3. G. Shanmugamand M. S. Palanichamy, Basic Civil and Mechanical Engineering,Tata McGraw Hill Publishing Co., New Delhi, 2009
4. Pravin Kumar, Basic Mechanical Engineering, Pearson Education India, Pearson,2013.
5. G. Shanmugam and S. Ravindran, Basic Mechanical Engineering, Tata McGraw- Hill Publishing Company Limited, New Delhi, 2013.
6. S. R. J. Shantha Kumar, Basic Mechanical Engineering, Hi-tech Publications, Mayiladuthurai, 2015

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	7					10																			17
2	7					10																			17
3	4					6			4																14
4	7					12																			19
5	5					10																			15
6	6					12																			18
Total																									100

Assessment Questions

Remember

1. Classify Boiler.
2. What are the uses of high carbon steel?
3. Define welding
4. Define soldering.
5. Define Brazing.
6. What do you mean by milling?
7. Classify IC Engines.
8. List the various components of IC Engines.
9. Define Refrigeration.
10. Classify Boiler.
11. What is turbine?
12. Define water tube boiler.
13. Name the main parts of a turbine.
14. Classify power plants.
15. Writedown the scope of Civil Engineering.
16. Define surveying.
17. List the ingredients of concrete.
18. State the basic principles of survey.
19. What is meant by lintel?
20. Write down the components of buildings.
21. List the functions of foundation.
22. What is meant by bearing capacity of soil?
23. What are the factors to be considered in selection of site?
24. Define gauges.
25. Name the components of permanent way.
26. State the importance of railway.
27. List out the types of bridge.
28. Write down the classification of highway.
29. What do you meant by rain water harvesting
30. What are the factors to be considered in design of green building?

Understand

1. Compare reaction and impulse turbines.
2. What is the difference between renewable and non-renewable sources of energy?
3. What is the function of a hydraulic turbine?
4. What is the function of a surge tank in Hydel power plant?
5. What is the function of a moderator in Nuclear power plant?
6. How to select the boiler?
7. Why air is pre-heated before enter into boiler?
8. How does a fusible plug function in boiler?
9. What is the function of a spark plug in IC engine?
10. What is the function of a fuel injector in diesel engine?
11. Compare and contrast 4 stroke and 2 stroke engine.
12. Describe the characteristics of good building stone.
13. Explain the various functions of Civil Engineer.
14. Discuss in detail about principles of surveying.
15. Describe the characteristics of cement and concrete.
16. Differentiate the English and Flemish bonds brick masonry.
17. What are the points to be observed in the construction of brick masonry?
18. Discuss about any four super structure components.
19. Distinguish between shallow and deep foundation.
20. Distinguish between stone and brick masonry.
21. Differentiate bituminous and cement concrete roads.

22. Elucidate the components of permanent way.
23. Describe the cross section of bituminous pavement.
24. Elucidate different sources of water supply.

Apply

1. Explain in detail about rain water harvesting.
2. Explain the process of water treatment.
3. Enumerate the procedure for construction of water bound macadam road.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15GE106 C PROGRAMMING 3 0 2 4

Course Objectives

- Understand the basics of C primitives, operators and expressions.
- Gain knowledge about the different primitive and user defined data types.
- Impart knowledge about the structural programming concepts.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Implement C programs using operators, type conversion and input-output functions.
2. Apply decision making and looping statements in writing C programs.
3. Develop C programs using the concepts of Arrays and strings.
4. Apply the concepts of functions and pointers in writing C programs.
5. Design applications using structures, unions and files in C.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2				2								
2			2		1									
3			3			2								
4			2			1								
5		3	2			1								

UNIT I **9 Hours**

INTRODUCTORY CONCEPTS

C Primitives: Introduction to C- Planning and writing a C program- Character Set - Keywords and Identifiers - Data Types - Variables and Constants - Compiling and executing the C program Operators and Expressions: Arithmetic - Relational - Logical - Increment and decrement - Conditional - Bitwise - Comma - Sizeof() - Assignment - Shift operator - Precedence and order of evaluation - Type Conversion
Input and Output Operations: Formatted I/O functions - getchar and putchar function - gets and puts functions

UNIT II **7 Hours**

CONTROL STATEMENTS

Decision Making and Branching: simple if statement - if else statement - nesting of if else Statement - Switch Statement.
Decision Making and Looping: while statement - do while statement - for statement - Nested for statement
Jump Statements: goto - break - continue - return statement

UNIT III **9 Hours**

ARRAYS AND STRINGS

Arrays: Introduction, one dimensional array, declaration - Initialization of one dimensional array, two-dimensional arrays, initializing two dimensional arrays, multi dimensional arrays.

Strings: Declaring and initializing string variables- Reading strings from terminal - writing string to screen - String handling functions.

UNIT IV **10 Hours**

FUNCTIONS AND POINTERS

User Defined Functions: Elements of user defined functions - Definition of functions - return values and their types - function calls - function declaration - categories of function - call by value and call by reference - recursion - Pre-processor directives and macros.
Pointers: Understanding Pointers - accessing the address of the variable - declaring pointer variables - Initialization of pointer variables - Accessing a variable through its pointer

UNIT V **10 Hours**

STRUCTURES AND FILES

Storage Class Specifiers: Auto - registers - static - extern - typedef Structures and Unions: Introduction - defining a structure - declaring structure variables - accessing structure members - structure initialization - Unions - Enumerated data type
File Management in C: Defining and opening a file - closing a file - Input/output operations on files - Command line arguments

FOR FURTHER READING

Problem solving - Logical thinking - logic - symbolic logic - truth tables - Math puzzles - magic triangles - magic squares - alphabetic puzzles - Cross number puzzles.
Creating and manipulating document using word - Mail merge - Creating spread sheet with charts and formula using excel - developing power point presentation with Animations.

1 **3 Hours**

EXPERIMENT 1

Write a C program to perform arithmetic operations on integers and floating point numbers.

2 **3 Hours**

EXPERIMENT 2

Write a C program to implement ternary operator and relational operators.

3 **3 Hours**

EXPERIMENT 3

Write a C program to read the values of A,B,C through the keyboard. Add them and after addition check if it is in the range of 100 to 200 or not. Print separate message for each.

4 **3 Hours**

EXPERIMENT 4

Write a C program to display the roots of a quadratic equation with their types using switch case.

5 **3 Hours**

EXPERIMENT 5

Write a C program to generate the following triangle.
1
1 2 3
1 2 3 4 5
1 2 3 4 5 6 7

6 **3 Hours**

EXPERIMENT 6

Write a C program to get a matrix of order 3x3 and display a matrix of order of 4x4, with the fourth row and column as the sum of rows and columns respectively.

7 **3 Hours**

EXPERIMENT 7

Write a C program to remove the occurrence of "the" word from entered string.

8 **3 Hours**

EXPERIMENT 8

Write a C program to find the factorial of given number.

9 **3 Hours**

EXPERIMENT 9

Design a structure to hold the following details of a student. Read the details of a student and display them in the following format Student

details: rollno, name, branch, year, section, cgpa.

****

NAME:

ROLL NO:

BRANCH:

YEAR:

SECTION:

CGPA:

10 **3 Hours**

EXPERIMENT 10

Create two files test1.txt and test2.txt and write a C program to read the file text1.txt character by character on the screen and paste it at the end of test2.txt.

Total: 75 Hours

Reference(s)

1. Herbert Schildt, C -The complete Reference, Tata McGraw-Hill, 2013
2. Byron Gottfried , Programming with C, Schaum's Outlines, Tata Mcgraw-Hill, 2013
3. E.Balagurusamy, Programming in ANSI C, Tata McGraw-Hill, 2012
4. Kernighan B W and Ritchie O M, The C programming Language. Prentice-Hall of India, 2009
5. Kelley A and I. Pohl, A Book on C : Programming in C, Pearson Education, 1998
6. Ashok.N.Kamthane,Programming in C,Pearson education,2013

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	4			4	4																			16
2	2				2	4				6				2				2				2			20
3	2				2					6				2	3							6			21
4		2			2					6				2	3							6			21
5		2				2				6				6								6			22
																								Total	100

Assessment Questions

Remember

1. List the rules for defining a variable.
2. State the associativity property of an operator.
3. List the three constructs for performing loop operations.
4. Recall return statement.
5. Define an array.
6. Recognise strings.
7. Define functions.
8. Define pointers.
9. Define a structure.
10. List the functions used for opening and closing a file.

Understand

1. Classify the operators in C.
2. Identify the functions used for formatted I/O in C.
3. Summarise the branching statements in C.
4. Summarise the branching statements in C.
5. Summarise the looping statements in C.
6. Claasify the types of arrays in C.
7. Summarise the string handling functions in C.
8. Exemplify call by value and call by reference.
9. Illustrate the pointer concepts in C.
10. Summarise the four storage classes.
11. Explain the concept of files in C.

Apply

1. Compute the greatest of two numbers using ternary operators in C.
2. Demonstrate the concept of type conversion in C.
3. Implement a C program to find the roots of a quadratic equation using Switch case statement.
4. Implement a C program to check whether a number is prime or not.
5. Compute matrix multiplication using two dimentional arrays in C.
6. Execute a C program to check whether a string is a palindrome or not.
7. Implement a C program using functions to find factorial of a number.
8. Implement a C program to use pointers in C.
9. Execute a C program to generate a pay slip for an employee using structures.
10. Implement a C program to copy the content of one file to the other.

Analyse

1. Differentiate getchar and putchar functions.
2. Differntiate while and do while loop in C.
3. Compare strupr and strlwr functions.
4. Differntiate function definition and function call.
5. Differntiate function definition and function call.
6. Compare structure and union.

Evaluate

1. Determine the output of the following code.
```
#include
int main()
{
int var = 010;
printf("%d", var);
}
```
2. Determine the value of the logical expressionÂ a>b && a
3. Determine the output of the C code
```
#include
int main()
{
int a[5] = {5, 1, 15, 20, 25};
int i, j, m;
i = ++a[1];
j = a[1]++;
m = a[i++];
printf("%d, %d, %d", i, j, m);
return 0;
}
```
4. Determine the output of this C code.
```
#include
int main()
{
int a = 10, b = 10;
if (a = 5)
b--;
printf("%d, %d", a, b--);
}
```
5. Evaluate the expression c=(a+b*(c/d)%e) wih a=10, b=3, c=5, d=6 and e=1

Create

1. Generate a structure to store the following details: Rollno, Name, Mark1, Mark2, Mark3, Total, Average, Result and Class. Write a program to read Rollno, name and 3 subject marks. Find out the total, resultÂ and class as follows:
   a) Total is the addition of 3 subject marks.
   b) Result is "Pass" if all subject marks are greater than or equal to 50 else "Fail".
   c) Class will be awarded for students who have cleared 3 subjects
   i. Class "Distinction" if average >=75
   ii. Class "First" if average lies between 60 to 74 (both inclusive)
   iii. Class "Second" if average lies between 50 & 59 (both inclusive)
   d) Repeat the above program to manipulate 10 students' details and sort the structures as per rank obtained by them.
2. Create a structure that can describe the employees with the fields Eno, Ename. Basic. Write a program to calculate DA = 32% of Basic. HRA = 15% of Basic. CCA = 10% of BASIC, PF = 15%Â of Basic and print all details with Net pay. All processing should be using pointer notation.
   b) Result is "Pass" if all subject marks are greater than or equal to 50 else "Fail".
   c) Class will be awarded for students who have cleared 3 subjects
   i. Class "Distinction" if average >=75
   ii. Class "First" if average lies between 60 to 74 (both inclusive)
   iii. Class "Second" if average lies between 50 & 59 (both inclusive)
   d) Repeat the above program to manipulate 10 students' details and sort the structures as per rank obtained by them.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15GE207 ENGINEERING GRAPHICS 0 0 4 2

Course Objectives

- To learn conventions and use of drawing tools in making engineering drawings.
- To draw orthographic projections of points, line and solids.
- To draw the section of solids and development of surfaces of the given objects.
- To draw the isometric projections and perspective projections of the given solids.
- To introduce CAD software to draw simple two dimensional drawings.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Recognize the conventions and apply dimensioning concepts while drafting simple objects.
2. Draw the orthographic projection of points, line, and solids.
3. Draw the section of solid drawings and development of surfaces of the given objects.
4. Draw the isometric and perspective projection of the given objects.
5. Draw the simple two dimensional drawings using computer aided drawing tool.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2				1									
2	2				2									
3	2					1								
4	1					3								
5	2					1								

1 **12 Hours**

CONVENTIONS AND BASIC DRAWINGS

Importance - conventions - ISO and BIS - drawing tools and drawing sheets - lettering, numbering, dimensioning, lines and Symbols-Conic sections - types constructions -ellipse, parabola and hyperbola - eccentricity and parallelogram method.

2 **14 Hours**

ORTHOGRAPHIC PROJECTIONS

Principles - first and third angle projections - Points - first angle projection of points, straight lines - parallel, perpendicular and inclined to one reference plane, solid - cylinders, pyramids, prisms and cones.

3 **12 Hours**

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACE

Section of solids - simple illustrations. Development of surfaces - cylinders, pyramids, prisms, cones and simple truncated objects.

4 **12 Hours**

ISOMETRIC AND PERSPECTIVE PROJECTIONS

Importance - orthographic to isometric projection - simple and truncated solids- perspective projections of simple solids.

5 **10 Hours**

INTRODUCTION TO COMPUTER AIDED DRAWING (NOT FOR END SEMESTER EXAMINATION)

Basics commands of AutoCAD - two dimensional drawing, editing, layering and dimensioning - coordinate Systems -Drawing practice - orthographic views of simple solids using AutoCAD.

Total: 60 Hours

Reference(s)

1. K Venugpoal, Engineering Drawing and Graphics, Third edition, New Age International, 2005.
2. Basant Agrawal, Mechanical drawing, Tata McGraw-Hill Education, 2008.
3. Engineering Drawing Practice for Schools & Colleges, BUREAU OF INDIAN STANDARDS-SP46, 2008.
4. N. D. Bhatt and V. M. Panchal, Engineering Drawing, Charotar Publishing House Pvt. Limited, 2008.
5. K.V.Natarajan, A Text Book of Engineering Graphics, Dhanalakshmi Publishers, 2013.
6. George Omura, Brian C. Benton, Mastering AutoCAD 2015 and AutoCAD LT 2015: Autodesk Official Press, Wiley Publisher, 2015.

Evaluation Pattern

Class work (based on attendance) / CW 5	5
Assignment I / AI 10 Assignment VIII / A 10 Assignment VII / A 10 Assignment VI / A 10 Assignment V / A 10 Assignment IV / AIV 10 Assignment III / AIII 10 Assignment II / AII 10	20
Model Examination (EG) / ME 100	25

15MA201 VECTOR CALCULUS AND COMPLEX ANALYSIS

3 2 0 4

Course Objectives

- Implement the Complex Analysis, an elegant method in the study of heat flow, fluid dynamics and electrostatics.
- Summarize and apply the methodologies involved in solving problems related to fundamental principles of Calculus viz: Differentiation, Integration and Vectors.
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Determine & apply the important quantities associated with vector fields such as the divergence, curl and scalar potential.
2. Apply the theoretical aspects of vector integral calculus in their core areas.
3. Explain the differentiation properties of vectors.
4. Identify the complex functions and their mapping in certain complex planes.
5. Use the concepts of integration to complex functions in certain regions.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			3											
2	1	2												
3		3												
4	1	2												
5	3													

UNIT I **10 Hours**

VECTOR CALCULUS

Gradient -Divergence -Curl - Directional derivative- Solenoidal -Irrotational vector fields -Line Integral -Surface integrals.

UNIT II **9 Hours**

INTEGRAL THEOREMS OF VECTOR CALCULUS

Green's theorem in a plane- Stoke's Theorem- Gauss divergence theorem- Applications involving cubes and parallelepiped.

UNIT III **8 Hours**

ANALYTIC FUNCTIONS

Analytic Functions- Necessary and Sufficient conditions of Analytic Function- Properties of Analytic function - Determination of Analytic Function using Milne Thompson method -Applications to the problems of Potential Flow.

UNIT IV **8 Hours**

MAPPING OF COMPLEX FUNCTIONS

Physical interpretation of mapping- Application of transformation: translation, rotation, magnification and inversion of multi valued functions - Linear fractional Transformation (Bilinear transformation).

UNIT V **10 Hours**

INTEGRATION OF COMPLEX FUNCTIONS

Cauchy's Fundamental Theorem - Cauchy's Integral Formula - Taylor's and Laurent's series- Classification of Singularities - Cauchy's Residue Theorem.

FOR FURTHER READING

Applications to Electrostatic and Fluid Flow.

Total: 75 Hours

Reference(s)

1. C. Ray Wylie and C. Louis Barrett, Advanced Engineering Mathematics, Tata McGraw-HillPublishing Company Ltd, 2003
2. Erwin Kreyszig , Advanced Engineering Mathematics, Tenth Edition, Wiley India Private Limited,New Delhi 2015
3. J. A. Brown and R. V. Churchill, Complex Variables and Applications , Sixth Edition, McGraw Hill,New Delhi, 1996
4. B. S. Grewal, Higher Engineering Mathematics, Forty third Edition, Khanna Publications , New Delhi 2014
5. Peter V. O. Neil, Advanced Engineering Mathematics, Seventh Edition ,Cengage Learning India Private Limited, 2012
6. Glyn James, Advanced Engineering Mathematics, Third Edition,Wiley India,2007

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2					6					8			4			2								22
2	2					4				4					4				6						20
3		2									10								6						18
4	2						4				6				6										18
5	2						4			6				4					6						22
Total																									100

Assessment Questions
Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15GE105 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

2 0 2 3

Course Objectives

- To understand the basic concepts of electric circuits and magnetic circuits.
- To illustrate the construction and operation of various electrical machines and semiconductor devices.
- To Learn the fundamentals of communication systems.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Apply the fundamental laws to electric circuits and compute the different alternating quantities.
2. Apply the laws of magnetism for the operation of DC motor.
3. Examine the construction and working principle of different AC machines
4. Analyze the different speed control methods of DC motors and special machines.
5. Analyze the performance characteristics and applications of semiconductor devices.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1				1									
2	1		3			1								
3	2	1												
4		1	2		1									
5		1	2		1									

UNIT I **7 Hours**

ELECTRIC CIRCUITS

Definition of Voltage, Current, Electromotive force, Resistance, Power & Energy, Ohms law and Kirchoffs Law & its applications - Series and Parallel circuits - Voltage division and Current division techniques - Generation of alternating emf - RMS value, average value, peak factor and form factor- Definition of real, reactive and apparent power.

UNIT II **5 Hours**

DC MACHINES

Introduction of magnetic circuits - Law of Electromagnetic induction, Flemings Right & Left hand rule- Types of induced emf - Definition of Self and Mutual Inductance - DC Motor- Contruction - Working Principle- Applications.

UNIT III **6 Hours**

AC MACHINES

Single Phase Transformer - Alternator - Three phase induction motor - Single phase induction motor - Contruction - Working Principle - Applications.

UNIT IV **5 Hours**

ELECTRICAL DRIVES

Speed control of dc shunt motor and series motor - Armature voltage control - Flux control - Construction and operation of DC servo motor - Construction and operation of DC servo motor stepper motor.

UNIT V **7 Hours**

ELECTRON DEVICES AND COMMUNICATION

Characteristics of PN Junction diode and Zener diode - Half wave and Full wave Rectifiers - Bipolar Junction Transistor - Operation of NPN and PNP transistors - Logic gates - Introduction to communication systems.

FOR FURTHER READING

Voltage Regulator - Stepper motor - Energy meter - SMPS, Satellite and Optical communication.

1 **4 Hours**

EXPERIMENT 1

Analyze the VI characteristics of a fixed resistor and a lamp by varying its temperature.

2 **4 Hours**

EXPERIMENT 2

Apply the voltage division and current division techniques for series and parallel connections of lamp loads.

3 **4 Hours**

EXPERIMENT 3

Understand the concept of electromagnetic induction using copper coil.

4 **4 Hours**

EXPERIMENT 4

Understand the construction and working principle of DC machines.

5 **6 Hours**

EXPERIMENT 5

Determine the VI Characteristics of PN Junction diode and plot the input and output wave shapes of a half wave rectifier.

6 **4 Hours**

EXPERIMENT 6

Realize the working of transistor as an electronic switch through experiments.

7 **4 Hours**

EXPERIMENT 7

Lighting applications using logic gates principle.

Total: 60 Hours

Reference(s)

1. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
2. Smarjith Ghosh, Fundamentals of Electrical and Electronics Engineering, Prentice Hall (India) Pvt. Ltd., 2010

3. A. Sudhakar, Shyammohan S Palli, Circuits and Networks Analysis and Synthesis, Tata McGraw Hill, 2010
4. R. S. Sedha, A Textbook of Applied Electronics, S.Chand & Company Ltd, 2013
5. Muthusubramanian & Salivahanan, Basic Electrical and Electronics Engineering and Communication Engineering, Seventh Edition, Tata MCGraw Hill Education Private Limited, 2011

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2					2	2			2			2				2			2		2		4	20
2		3									2	2		2					2	2			2	5	20
3			3				2				2			6				2		2		3			20
4				2				2		2		2			4		3		2				3		20
5			2				2			2				3				3	3		2			3	20
Total																									100

Assessment Questions

Remember

1. State kirchoff's current law.
2. State Ohm's law.
3. State kirchoff's voltage law.
4. State Faraday's law of electromagnetic induction.
5. Define reluctance.
6. Define magnetic flux.
7. State the operating principle of a transformer.
8. State the operating principle of DC motor
9. State Fleming's Left hand rule.
10. State Fleming's right hand rule.
11. Label the V-I characteristics of zener diode.
12. Reproduce the block diagram of communication system
13. List the applications of DC motors.

Understand

1. Give the properties of flux lines.
2. Compare series and parallel circuits.
3. Classify the magnetic circuits.
4. Explain the concepts of self and mutually induced emf.
5. Interpret the laws of electromagnetic induction.
6. Illustrate the working principle of a transformer.
7. Illustrate the construction and working principle of three phase induction motor.
8. Summarise the characteristics of PN junction diode in forward and reverse biasing.
9. Explain the operation of PNP and NPN transistor.
10. Illustrate the input and output characteristics of transistor CE configuration.
11. Summarize the truth table for logic gates.

Apply

1. Three resistors are connected in series across a 12V battery. The first resistance has a value of 2 ohm, second has a voltage drop of 4V and third has power dissipation of 12 W. Calculate the value of the current in the circuit.
2. A 25 ohm resistor is connected in parallel with a 50 ohm resistor. The current in 50 ohm resistor is 8A. What is the value of third resistance to be added in parallel to make the total line current as 15A.

3. The self inductance of a coil of 500turns is 0.25H. If 60% of the flux is linked with a second coil of 10500 turns. Calculate a) the mutual inductance between the two coils and b) emf induced in the second coil when current in the first coil changes at the rate of 100A/sec.
4. An air cored toroidal coil has 480 turns, a mean length of 30cm and a cross-sectional area of 5 cm2.Calculate a)the inductance i\of the coil and b) the average induced emf, if a current of 4 A is reversed in 60 milliseconds
5. Show the applications of DC motors.
6. Demonstrate the full wave bridge rectifier.
7. Demonstrate the speed control of DC shunt motor.
8. Demonstrate the speed control of DC series motor.
9. Demonstrate the speed control of DC series motor.
10. Find the average and RMS value of EMF of half wave rectifier.

Analyse

1. Outline the voltage, current and power in a resistor supplied with an alternating voltage.
2. Resolve the expression for RMS, average value, peak and form factor of sinusoidal voltage
3. Organize the expressions for self inductance and mutual inductance.
4. Diffentiate electric and magnetic circuit.
5. Differentiate the squirrel cage induction motor and slip ring induction motor.
6. Differentiate step up and step down transformer.
7. Outline the characteristics of zener doide.
8. Demonstrate the characteristics of PNP transistor.
9. Resolve the expression of ripple factor, efficiency of full wave bridge rectifier.
10. Justify, why domestic appliances connected in parallel.
11. Resolve the expression of ripple factor, efficiency of half wave bridge rectifier.
12. Derive the expression for self and mutual inductance.
13. Derive the expression for form factor of half and full wave rectifier.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15IT206 PROGRAMMING USING C++ 3 0 2 4

Course Objectives

- Understand the concept of Object Oriented Programming
- Apply the Object oriented concepts to solve problems using C++
- Develop programs using files and templates

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Develop solutions to problems demonstrating the use of classes, objects, constructors and destructors
2. Program using c++ features such as composition of objects, operator overloading
3. Develop c++ applications by using the concepts of inheritance
4. Apply pointer and stream concepts in writing c++ programs
5. Simulate problems in operating system, computer networks, system software by using files, exception handling and templates in c++

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3		3								1	1
2	1	2	3		3								1	1
3	1	2	3		3								1	1
4	1	2	3		3								1	1
5	1	2	3		3								1	1

UNIT I **7 Hours**

CLASSES AND OBJECTS

Need for object oriented programming - Characteristics of object oriented programming - Classes and Objects: Simple Class - Nesting of Member functions - Static Data Members and Member Functions - Constructors and Destructors - Returning Objects from Functions.

UNIT II **7 Hours**

ARRAYS, STRINGS AND OVERLOADING

Array Fundamentals - Arrays as Class Member Data - Arrays of Objects - String Manipulations - Operator overloading: Unary Operators - Binary Operators - Special Operators - Pitfalls of Operator Overloading and Data Conversion.

UNIT III **5 Hours**

INHERITANCE

Derived Class and Base Class - Derived Class Constructors - Overriding Member Functions - Public and Private Inheritance - Types of Inheritance: Single, Multi Level, Multiple, Hierarchical and Hybrid - Virtual Base Classes - Abstract Classes.

UNIT IV **6 Hours**

FUNCTIONS AND STREAMS

Pointers - this Pointer - Pointers to Objects and Derived Classes - Function Overloading - Virtual Function - Friend Function - Static Function - Streams: Stream Classes - Unformatted I/O Operations - Formatted Console I/O Operations.

UNIT V **5 Hours**

FILES, STREAMS AND EXCEPTION HANDLING

File Stream Operations: File Pointers Manipulation - Templates: Class Templates - Function Templates - Overloading Function Templates - Exception Handling Mechanism: Try Throw and Catch.

FOR FURTHER READING

Payroll system using polymorphism - Integrated grade book for students using arrays - Virtual destructor - Proxy classes.

1 **5 Hours**

EXPERIMENT 1

Implementation of operator overloading with class and objects.

2 **5 Hours**

EXPERIMENT 2

Implementation of types of Inheritance.

3 **5 Hours**

EXPERIMENT 3

Implementation of two different classes for adding a private data member using friend function.

4 **5 Hours**

EXPERIMENT 4

Implementation of operator and function overloading.

5 **5 Hours**

EXPERIMENT 5

Implementation of file handling operations.

6 **5 Hours**

EXPERIMENT 6

Implementation of Class templates and Function templates.

Total: 60 Hours

Reference(s)

1. E Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill Publishing, New Delhi, 2011.
2. Robert Lafore, Object Oriented Programming in C++, Galgotia Publication, 2010.
3. B Trivedi, Programming with ANSI C++, Oxford University Press, 2010.
4. H M Deitel and P J Deitel, C++ How to Program, Seventh Edition, Prentice Hall, 2010.
5. Herbert Schildt, C++: The Complete Reference, Fourth Edition, Tata McGraw-Hill, 2010.
6. K R Venugopal, Rajkumar and T Ravishankar, Mastering C++, Tata McGraw Hill Publishing, New Delhi, 2010.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1		2			2	4				2	2			2				2				4			20
2		2				2				4				4				3				5			20
3		1				2				2	3			4				4						4	20
4		2			1	2				4				4				4				4			21
5	1		2		1	2				3					3			3				2		2	19
Total																									100

Assessment Questions

Remember

1. Write the features of object-oriented programming.
2. Recall the types of constructors.
3. constructor is declared and defined?
4. Give the advantages of dynamic initialization.
5. Name the types of pre-defined exceptions.
6. What are the operators not possible to overload?
7. List the advantages of virtual function.
8. What is abstract class?

Understand

1. Data items in a class must be private – Justify.
2. Is it possible to overload a constructor? Justify.
3. Contrast the overloading and overriding.
4. Differentiate multiple and hierarchical inheritance.
5. Indicate how to create manipulators.
6. Contrast Function template with class Template.

Apply

1. Demonstrate how to implement the runtime polymorphism using C++
2. How do you differentiate a constructor from an ordinary function?
3. How to create an array using new operator?

Analyse

1. Compare class template and function template.
2. Justify how structure is different from classes.
3. Differentiate with example for operator and function overloading.
4. Identify the functionalities of File Pointers.
5. Illustrate the Limitation of array of Static Function.

Evaluate

1. Defend the steps involved in Exception handling.
2. Summarize the various built in String functions available in C++.
3. Support with example for Character I/O streams.
4. Evaluate the guidelines for finding file path.

Create

1. Write a bank application using class and objects.
2. Create an application for scientific calculator using inheritance.
3. Create a stack operation using function templates.
4. Generate the pseudo code for Friend Function and Virtual Function.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15GE107 WORKSHOP PRACTICE 0 0 2 1

Course Objectives

- To provide hands on training for fabrication of components using carpentry, sheet metal and welding equipment / tools.
- To gain the skills for making fitting joints and household pipe line connections using suitable tools.
- To develop the skills for preparing the green sand mould and to make simple household electrical connection
- To provide hands on training for dismantling and assembling of petrol engines, gear box and pumps.
- To develop the skills for making wood/sheet metal models using suitable tools

Programme Outcomes (POs)
Course Outcomes (COs)

1. Fabricate simple components using carpentry, sheet metal and welding equipment/tools
2. Make fitting joints and household pipe line connections using suitable tools.
3. Prepare green sand mould and make simple household electrical connections using suitable tools
4. Dismantle and assemble petrol engines, gear box and pumps.
5. Make simple models using wood and sheet metal.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						2								
2					1	2								
3					2									
4					1									
5						2								

1 **2 Hours**

EXPERIMENT 1
Forming of simple object in sheet metal using suitable tools (Example: Dust Pan / Soap Box)

2 **4 Hours**

EXPERIMENT 2
Fabrication of a simple component using thin and thick plates. (Example: Book rack)

3 **2 Hours**

EXPERIMENT 3
Making a simple component using carpentry power tools. (Example: Pen stand/Tool box/ Letter box].

4 **2 Hours**

EXPERIMENT 4
Prepare a "V" (or) Half round (or) Square joint from the given mild Steel flat.

5 **4 Hours**

EXPERIMENT 5

Construct a household pipe line connections using pipes, Tee joint, Four way joint, elbow, union, bend,
Gate way and Taps (or) Construct a pipe connections of house application centrifugal pump using pipes,
bend, gate valve, flanges and foot valve.

6 **4 Hours**

EXPERIMENT 6

Prepare a green sand mould using solid pattern/split pattern.

7 **4 Hours**

EXPERIMENT 7

Construct a domestic electrical wire connections using indicator, one way switch with calling bell, two
way switch with lamp, one way switch with fan regulator and one way switch with socket.

8 **4 Hours**

EXPERIMENT 8

Dismantling and assembly of Centrifugal Monoblock / Gear Pump / Gear box.

9 **2 Hours**

EXPERIMENT 9

Dismantling and assembly of two stroke and four stroke petrol engine.

10 **2 Hours**

EXPERIMENT 10

Mini Project(Fabrication of Small Components).

Total: 30 Hours

Evaluation Pattern

Preparation / Pre 10	5
Experiment & Results / E&R 10	10
Record / Observation / RO 10	5
Test -Cycle I / TCI 50	15
Test-Cycle II / TCII 50	15

15MA301 FOURIER SERIES AND TRANSFORMS 3 2 0 4

Course Objectives

- Understand the concepts of Fourier series, Transforms and Boundary Conditions, which will enable them to model and analyze the physical phenomena
- Implement the Fourier analysis, an elegant method in the study of heat flow, fluid mechanics and electromagnetic fields.
- Summarize and apply the mathematical aspects that contribute to the solution of one dimensional wave equation
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Recognize the periodicity of a function and formulate the same as a combination of sine and cosine using Fourier series.
2. Formulate a function in frequency domain whenever the function is defined in time domain.
3. Apply the Fourier transform, which converts the time function into a sum of sine waves of different frequencies, each of which represents a frequency component.
4. Classify a partial differential equation and able to solve them.
5. Use the Z-transform to convert a discrete-time signal, which is a sequence of real or complex numbers, into a complex frequency domain representation.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	2													
3	1	2												
4		3												
5			3											

UNIT I **9 Hours**

FOURIER SERIES

Dirichlet's conditions - General Fourier series - Odd and even functions - Half range cosine and sine series - Root mean square value.

UNIT II **13 Hours**

LAPLACE TRANSFORM

Laplace Transform- Existence Condition -Transforms of Standard Functions - Unit step function, Unit impulse function- Properties- Transforms of Derivatives and Integrals - Initial and Final Value Theorems - Laplace transform of Periodic Functions - Inverse Laplace transforms.

UNIT III **8 Hours**

FOURIER TRANSFORM

Fourier Integral Theorem- Fourier Transform and Inverse Fourier Transform- Sine and Cosine Transforms - Properties - Transforms of Simple Functions - Convolution Theorem - Parseval's Identity

UNIT IV **8 Hours**

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Classification of Second Order Quasi Linear Partial Differential Equations - Fourier Series Solutions of One Dimensional Wave Equation - One Dimensional Heat Equation - Steady State Solution of Two-Dimensional Heat Equation - Fourier Series Solutions in Cartesian Coordinates.

UNIT V **7 Hours**

Z -TRANSFORM

Z-Transform - Elementary Properties - Inverse Z-Transform - Convolution Method- Partial fraction method - Solution of Difference Equations using Z-Transform.

FOR FURTHER READING

Solutions of one dimensional wave equation and heat equations using Laplace transforms method.

Total: 75 Hours

Reference(s)

1. Larry.C.Andrews and Bhimsen.K.Shivamoggi, Integral Transforms for Engineers, First Edition, PHI Learning, New Delhi, 2007
2. Ian.N.Sneddan, The Use of Integral Transforms, Second Edition, McGraw Hill companies, 1972.
3. E. Kreyszig, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Sons, Inc, Singapore, 2008.
4. Peter V. O. Neil,Advanced Engineering Mathematics, Seventh Edition, Cenage Learning India Private Ltd, 2012.
5. B.S. Grewal, Higher Engineering Mathematics, Fortieth Edition, Khanna Publications, New Delhi 2007.
6. C. Ray Wylie and C. Louis Barrett,Advanced Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd, 2003.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2					2					6				6				6						22
2	2					6				6					6				6						26
3		2					2				6							6							16
4		2					6				6				6										20
5	2						2			6									6						16
Total																									100

Assessment Questions
Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT302 DIGITAL SYSTEM DESIGN 3 2 0 4

Course Objectives

- Understand the most common digital logic families
- Design combinational and sequential circuits using logic gates

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Course Outcomes (COs)

1. Apply arithmetic operations in any number system and simplify the Boolean functions using Boolean algebra and Karnaugh maps.
2. Analyze and Design modular combinational logic circuits containing decoder, multiplexer, demultiplexer and adder
3. Construct the synchronous sequential circuits by using the functionality of registers, flip-flops, and counters.
4. Design the asynchronous sequential circuits and analyze the type of hazard in the designed circuits.
5. Model memory array for the given digital circuit problem.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	1	2	3											
3	1	2	3											
4	1	2	3											
5	1	2	3											

UNIT I **9 Hours**

FUNDAMENTALS

Number system and conversions - Boolean algebra and Simplification - Minimization of Boolean functions - Sum of Products and Product of Sums - Karnaugh map - Quine McCluskey Method - Prime Implicants and Essential Prime Implicants.

UNIT II **9 Hours**

COMBINATIONAL CIRCUITS

Introduction - Design Procedure - Binary Arithmetic circuits: BCD Adder, Magnitude Comparator - Encoders & Decoders - Multiplexers & Demultiplexers - Introduction to HDL - HDL model for combinational circuits.

UNIT III **9 Hours**

SYNCHRONOUS SEQUENTIAL CIRCUITS

Latches & Flip-Flops - Design Procedure for Synchronous Sequential Circuits - State Reduction and Assignment - Shift Registers - Synchronous Counters - Up Down counters - Counter design using Flip-Flops - HDL for sequential circuits.

UNIT IV **9 Hours**

ASYNCHRONOUS SEQUENTIAL CIRCUITS

Design Procedure for Asynchronous Sequential Circuits - Reduction of State and Flow Tables - Race free State Assignment - Hazards: Static and Dynamic Hazards.

UNIT V **9 Hours**

MEMORY AND PROGRAMMABLE LOGIC

Introduction - RAM and ROM - Memory decoding - Error detection and correction - Programmable Logic Array(PLA) - Programmable Array Logic(PAL) - Sequential programmable devices - Application specific integrated circuits.

FOR FURTHER READING

Study on digital logic integrated circuits.

Total: 75 Hours

Reference(s)

1. M Morris Mano, Digital Design, fifth edition, Pearson Education, 2015.
2. Charles H Roth, Jr., Fundamentals of Logic Design, fourth Edition, Jaico Publishing House, 2010.
3. Donald D Givone, Digital Principles and Design, Tata McGraw-Hill, 2013.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2		4		1		4								4										15
2	2				2					2	4			2	4				4						20
3	2				2	4			2	4			2	4					5						25
4	4		2		2	2			2	4				3	2			4							25
5	2	2						2			4			2					3						15
Total																									100

Assessment Questions

Remember

1. Define byte.
2. Which gate is equal to AND-inverter Gate?
3. What is latch? What is the difference between latch and flip flop?
4. Define prime implicants and Essential prime implicants.
5. What is the use of Don‘t care conditions?
6. List the characteristics of digital ICs.
7. Why parity checker is needed?
8. Draw the logic diagram of a 2 bit multiplier.
9. What is the decimal value for 10010?
10. What is code converter?

Understand

1. How will you build a full adder using 2 half adders and an OR gate?
2. Any number with an exponent of 1 is equal to _____.
3. Draw the logical diagram for the function without simplifying (A+B)(C+D)(A'+B+D)
4. Realize F(w, x, y, z)= Σ (1,4,6,7,8,9,10,11,15) using 8 to 1 Mux.
5. Prove AB+AB'C+BC'=AC+BC'
6. What are the four design procedures in combinational circuit?
7. Obtain the 1's and 2's complement for the binary number: 00010000.
8. Simplify the following Boolean expression to a minimum number of literals xy+xy'
9. Draw a NAND logic diagram that implements the complement of the followig function: F(A,B,C,D)=Σ(0,1,2,3,6,10,11,14)
10. Using Quine McCluskey method Simplify the Boolean expression F(v,w,x,y,z) = ∑ (4,5,9,11,12,14,15,27,30) +∑ø(1,17,25,26,31)

Apply

1. Show the binary to gray conversion for 110010.
2. Determine the minimum sum of products and minimum product of sums for f=b'c'd'+bcd+acd'ab'bc'd
3. Design a mod-7 counter using JK flip-flops.
4. Design a sequential circuit with four flip-flops ABCD. The next states B, C and D are equal to the present states of A, B, C respectively. The next state of A is equal to the EX-OR of present states of C and D.
5. Implement the following Boolean expression with exclusive-OR and AND gates: F=AB'CD' + A'BCD' +AB'C'D + A'BC'D
6. Simplify the given Boolean function F(A,B,C,D) = ∑m(0,1,2,8,10,11,14,15) using Quine Mc Clusky algorithm.
7. Simplify the following Boolean expressions using four-varianle maps: F(w,x,y,z) = ∑(1,4,5,6,12,14,15)
8. Realise the functions f1(x,y,z) = ∑m(1,2,4,5) and f2(x,y,z) = ∑m(1,5,7) using MUX.
9. Prove x+1=1
10. Using 10's complement, subtract 72532 from 3250.

Analyse

1. Explain why unused states generate don't - care terms when translating a state table to a transition table? Illustrate your response with a sample state table.
2. Explain why J - K flip - flops produce more don't-care terms than the other flIp - flop types, even when all of the states are specified.
3. Compare binary and gray code.
4. Differentiate between combinational and sequential logic.
5. Differentiate between PLA and PAL.
6. Define the need of characteristics table. Justify with JK flip-flop.
7. How does the Moore type vary from Mealy type sequence detector?

Evaluate

1. Design a synchronous circuit that has a single input variable and single output variable. The input data are received serially. The output Z is to change only when three consecutive input bits have the same value. Decide whether a Moore or a Mealy performs better.
2. Design a serial bit pattern detector that will detect the input sequence 01010 in a longer bit string. If the pattern is detected, then cause output Q to be active high. If a 011 bit pattern occurs within the same serial data string, cause output P to be active high. If the 011 pattern occurs, cause the state machine to initialize and start over looking for the 01010 pattern.

Overlapping sequences can occur. Compare the performance of the circuit for a Moore and Mealy configurations.

3. Consider the signed binary numbers :
   A=0100110 and B=01010011.
   Perform the operations (A-B) and (-A+B).

Create

1. Design a Mealy sequential machine that will detect the following input sequences x = 01101 or 01111. If input sequence x=01101 is met, cause z1 = 1. If x = 01111, cause z2 = 1. Each input sequence may overlap with itself or other sequence. Document the whole procedure.
2. Design a special hardware comparator that would keep track of the maximum and minimum of a series of numbers. The numbers are presented to the hardware one at a time beginning with the count of numbers followed by the numbers themselves.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT303 COMPUTER ARCHITECTURE 3 0 0 3

Course Objectives

- Interpret the basic computer structure and operational process of a digital computer system.
- Implement the fixed point and floating-point arithmetic operations in computing circuit.
- Articulate the processor technologies to execute parallel processing in single core and multi-core processor.
- Assimilate the memory hierarchy, interrupts and accessing of I/O devices of a digital computer system.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Classify the functional units of digital computer and explain its operational features, memory operations and instruction sequencing.
2. Apply the binary arithmetic in the computing circuit of a digital computer.
3. Determine the technique to execute multiple instructions in single core and multi-core processor.
4. Analyze the different processor technology that allows parallel execution of the instructions.
5. Interpret the memory hierarchy and accessing of I/O devices of a computer system.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3									1		
2	1	3	2											
3		1	3				2					1		
4	1	2	3				1							
5	1	2	3											

UNIT I **9 Hours**

COMPUTER STRUCTURE

Evolution of Computers - Functional units and its operational concepts - Performance - Memory operations, locations and addresses - Instruction and instruction sequencing - Addressing modes - Assembly language.

UNIT II **10 Hours**

ARITHMETIC OPERATIONS

Fixed Point Arithmetic - Addition and subtraction of signed numbers - Design of fast adders - Multiplication of positive numbers - Signed operand multiplication and fast multiplication - Integer division - Floating point numbers and operations.

UNIT III **10 Hours**

BASIC PROCESSING AND CONTROL UNIT

Basic MIPS implementation - Data path and control consideration - Execution of a complete instruction - Hardwired Control - Microprogrammed Control - Pipelining and its Hazards.

UNIT IV **8 Hours**

PARALLELISM

Instruction level parallelism - Parallel processing challenges - Flynn's classification - Hardware multithreading:SISD, MIMD, SIMD, SPMD and Vector multithreading- Multicore processors:Shared memory multiprocessor and cluster multiprocessor.

UNIT V **8 Hours**

MEMORY AND I/O SYSTEMS

Memory hierarchy : Cache memory and Virtual memory - Accessing I/O devices - DMA and interrupts.

FOR FURTHER READING

Communication methods: Buses and Interface - RISC and CISC processors - Stack Processor- Superscalar and vector processor.

Total: 45 Hours

Reference(s)

1. David A Patterson and John L Hennessey, Computer organization and design, fifth edition, Morgan Kauffman, 2014.
2. Carl Hamacher, Zvonko G Varanesic and Safat G Zaky, Computer Organisation, sixth edition, Mc Graw-Hill Inc, 2012.
3. William Stallings, Computer Organization and Architecture, seventh Edition, Pearson Education, 2006.
4. John P Hayes, Computer architecture and Organisation, third edition, Tata McGraw-Hill, 1998.
5. Morris Mano, Computer System Architecture, third edition, Prentice-Hall of India, 2000.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2					7					3			2											14
2			2			6					3			3				5							19
3		4				6					3			3				3				4			23
4		5				7					8			4					3			4			31
5		2					3				2			1								5			13
Total																									100

Assessment Questions

Remember

1. List the two ways to improve the performance of a computer
2. Program Partitioning and Scheduling Lines are defined as those lines which are coplanarand do not intersect, is the Condition of----------
   a)Partitioning
   b)Parallelism
   c)Scheduling
   d) Multiprocessing
3. Distinguish between static RAM and dynamic RAM.
4. The transformation 011……110=>100…….0-10 is called _____
5. What is clock rate?
6. List various addressing modes.
7. State booth's algorithm.
8. List out the types of buses.
9. List out the merits of RISC processor.
10. Define cycle stealing in DMA?
11. Recall the requirements for memory management.

Understand

1. Differentiate between deadlock and livelock.
2. Examine how Organization of the control unit allows the conditional branching in the microprogram control.
3. Describe the Flynn's classification of parallel architectures.
4. Distinguishes between write-through and write-back caches.
5. Explain the SIMD hardware multi-threading.
6. How would you measure the performance of the computer?
7. Illustrate the virtual memory technique.
8. Identify the influence of instruction sets with different modes.
9. Illustrate the use of cache memory and enumerate any two types of mapping methods.
10. Infer how interrupt request generate between I/O device and processor using interrupt priority schemes.
11. Explain how sequentially a complete instruction is executed by the processor.

Apply

1. Suppose a block needs to be written back while there are invalidations pending for it. Can this lead to problems, or is it safe? If it is problematic, how might you address the problem? Are eager exclusive replies useful with an underlying SC model? Are they at all useful ifthe processor itself provides out of order completion of memory operations, unlike the MIPS R10000?
2. Could you have a hierarchical bus based system with centralized memory (say) without pursuing the inclusion property between the L2 (node) cache and the L1 caches? If so, what complications would it cause?
3. Delaying the propagation of invalidations until a release point or even until the next acquire point (as in lazy release consistency) can be done in hardware-coherent systems as well. Why is LRC not used in hardware-coherent systems? Would delaying invalidations until a release be advantageous?
4. Subtract (1010)2 from (1101)2 using 1s complement.
5. Executethe expression (A*(B/C)) + (D-E) in various instruction formats with its transfer notations in registers.
6. Show how the instruction is processed between memory and the processor.
7. Consider the following instructions to be executed in a pipelining.
   Mul R2, R3, R4

Add R5, R4, R6 .
Originate the possible position where stall occurred.

8. Execute an addition with two numbers (11010 and 11100) using full adder circuit and display an array of carry values.
9. Execute the signed-operand multiplication of (-6)x(+15) using booth's algorithm
10. Convert the following pairs of decimal number to 5-Bit, signed, 2's complement, and binary number and add them. State whether overflow occurs in each case
    (a) 5 and 10
    (b) 7 and 13
    (c) -14 and 11
    (d) -5 and 7
    (e) -3 and -8
    (f) -10 and -13

11. In many computers the cache block size is in the range of 32 to 128 bytes. What would be the main advantages and disadvantages of making the size of cache blocks larger or smaller?
12. A computer uses a small direct mapped cache between the main memory and the processor. The cache hasfour 16-bit words, and each word has an associated 13-bit tag, as shown in fig (a). When a miss occursduring a read operation the requested word is read from the main memory and sends to the processor. At the same time, it is copied into the cache, and its block number is stored in the associated tag. Consider thefollowing loop in a program where all instruction and operands are 16-bits long:
    LOOP Add (R1)+,R0
    Decrement R2
    BNE LOOP
    (A) Cache (B) Main Memory
    FIGURE (a) cache and (b) main memory contents
    Assume that, before this loop is entered, registers R0, R1and R2 contain 0,054E and 3, respectively. Alsoassume that the main memory contain the data shown in the fig above, where all entries are given in hexadecimal notation. The loop starts at the location LOOP=02EC.
    Assume that, before this loop is entered, registers R0, R1and R2 contain 0,054E and 3, respectively. Alsoassume that the main memory contain the data shown in the fig above, where all entries are given in hexadecimal notation. The loop starts at the location LOOP=02EC.
    (a) Show the contents of the cache at the end of each pass through the loop
    (b) Assume that the access time of the main memory is 10τ and that of the cache is 1τ. Calculate theexecution time for each pass. Ignore the time taken by the processor between memory cycles.

Analyse

1. Evaluate the expression, A*B+C*D and write a program in a single-accumulator processor. Assume that the processor has load, store, multiply and add instructions, and that all values fit in the accumulator.
2. When a stream of instructions to the execution is interrupted the branch instructions execution will stall. How you will solve this problem in the following cases.
    i) Unconditional branches.
    ii) Conditional branches
3. How can we speed up the multiplication process?
4. How enough concurrency is identified in parallelism?
5. Why it is necessary to flush TLBs when doing migration or replication of pages?

6. One alternative to prefetching is to use non blocking load operations, and issue these operations significantly before the data are needed for computation. What are the tradeoffs between prefetching and using nonblocking loads in this way?

Evaluate

1. A computer uses a small direct mapped cache between the main memory and the processor. The cache hasfour 16-bit words, and each word has an associated 13-bit tag. When a miss occursduring a read operation the requested word is read from the main memory and sends to the processor. At the same time, it is copied into the cache, and its block number is stored in the associated tag. Consider thefollowing loop in a program where all instruction and operands are 16-bits long:
   LOOP Add (R1)+,R0
   Decrement R2
   BNE LOOP
   (A) Cache (B) Main Memory
   FIGURE (a) cache and (b) main memory contents
   Assume that, before this loop is entered, registers R0, R1and R2 contain 0,054E and 3, respectively. Alsoassume that the main memory contain the data shown in the fig above, where all entries are given in hexadecimal notation. The loop starts at the location LOOP=02EC.
   (a) Show the contents of the cache at the end of each pass through the loop
   (b) Assume that the access time of the main memory is 10τ and that of the cache is 1τ. Calculate theexecution time for each pass. Ignore the time taken by the processor between memory cycles.
2. An address space is specified by 24 bits and the corresponding memory space by 16 bits: How many words are there in the virtual memory and in the main memory?
3. Execute the non-restoring division of (8)/ (3).
4. Perform multiplication of 12, 8 using sequential circuit binary multiplier and also elaborate its register configuration with a neat diagram.
5. Does the number of processor is limited by bus organization?

Create

1. Investigate why RISC is universally accepted for all systems.
2. A pipeline processor uses the delayed branch technique. You are asked to recommend one of two
   possibilities for the design of this processor. In the first possibility, the processor has four stage pipeline and one delay slot, and in the second possibility, it has 6 stage pipeline with two delay slot. Compare the performance of these two alternatives, taking only the branch penalty into account. Assume that twentypercent of the instructions are branch instructions and that an optimizing compiler has 80 percent successrate in filling the single delay slot. For the second alternative, the compiler is able to fill the second slot 25percent of the time

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT304 SOFTWARE ENGINEERING 3 0 0 3

Course Objectives

- Understand the various process models available for software development
- Analyze, synthesize and design software systems for any given specification
- Apply basic software quality assurance practices to ensure that software designs, development, and maintenance meet or exceed applicable standards.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Design solutions using common life-cycle models for a given software problem
2. Apply the Requirement engineering process with emphasis on elicitation, analysis and modeling for any given software requirement.
3. Identify appropriate design strategies and analyze the requirement specifications for any software system.
4. Characterize various software testing techniques, analyze the given software requirements to determine appropriate testing techniques in commercial software environments
5. Interpret the process of software project management and estimate the suitable cost.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3	-			-					1	1	
2	2	1	2		1									
3	2	1	3										1	
4	1	2	3	2								1		
5	1	2	3								2	1	1	

UNIT I **8 Hours**

SOFTWARE PROCESS MODELS

Software Engineering Paradigm - Verification - Validation - Life Cycle Models: Water fall model, Incremental model, Spiral model, WIN WIN Spiral model, Prototyping model, Concurrent model, Unified model - Agile process models.

UNIT II **9 Hours**

REQUIREMENTS ANALYSIS AND SPECIFICATION

Software Requirements: Functional and Non-Functional, User requirements, System requirements - Requirement engineering process - Feasibility studies - Requirements Elicitation - Validation and management - Software prototyping - Prototyping in the software process - Rapid prototyping techniques - Analysis and modeling - Data, functional and behavioral models.

UNIT III **10 Hours**

SOFTWARE DESIGN

Design Concepts - Modular design - Design heuristic - Design model and document - Architectural design - Software architecture - Data design - Transform and transaction mapping - User interface design - Real Time Systems: Real time software design - System design - Real time executives.

UNIT IV **10 Hours**

SOFTWARE TESTING TECHNIQUES

Software testing fundamentals - Internal and external views of Testing - White box testing - Basis path testing - Control structure testing - Black box testing - Regression Testing - Unit Testing - Integration Testing - Validation Testing - System Testing and Debugging.

UNIT V **8 Hours**

SOFTWARE PROJECT MANAGEMENT

Software Cost Estimation - Function Point Models - COCOMO Model - Delphi Method - Scheduling - Earned Value Analysis - Error Tracking - Software Configuration Management - Program Evolution Dynamics - Software Maintenance - Project Planning - Project Scheduling- Risk Management - Reverse Engineering - CASE Tools.

FOR FURTHER READING

Software Quality assurance - Review techniques: informal and formal review techniques.

Total: 45 Hours

Reference(s)

1. Roger S Pressman, Software Engineering: A Practitioner Approach, Tata McGraw Hill, Eighth Edition, 2015.
2. I Sommerville, Software Engineering,9th edition, Addison Wesley, 2011
3. Richard Fairley, Software Engineering Concepts, Tata McGraw Hill, 2008

4. James S Peters, Witold Pedrycz, Software Engineering An Engineering Approach, Wiley India Edition, 2011

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2		2			2			1	2				4	2										15
2		2			1		3		2	2	2			2	2			4							20
3			4			2	4			4				2	4				2						22
4		2				2	2				4		1		4	2			4						21
5	1	1			2		4			4				2	4			2				2			22
Total																									100

Assessment Questions
Remember

1. Define software Engineering
2. List the various software life cycle models.
3. differentiate verification and validation.
4. Why does waterfall model sometimes fail?
5. Why is it difficult to gain a clear understanding of what the customer wants?
6. Label the internal and external views on testing.
7. Who are the stakeholders in a software project management?
8. Give any two software measures.
9. Stae the formula for estimating the effort time.
10. What are the measurable attributes of software quality program?

Understand

1. State the difference between customers and end users.
2. Explain the features of prototyping model and outline its merits and demerits.
3. Compare the various software development models.
4. Illustrate the software project management principles.
5. Interpret the difference between cohesion and coupling.
6. Classify the information produced as a consequence of requirement gathering.
7. Infer the user interface design steps in software dcesign process.
8. Express the term COCOMO cost estimation model with its equation.
9. Summarize the various stages involved in SCM process.
10. Explain RMMM plan.
11. Illustrate the control structure testing with its types.

Apply

1. Demonstrate the features of equivalence class partitioning with an example.
2. Show how to perform transform and transaction mapping.
3. Assess the importance of boundary value analysis and its similarity with equivalence partitioning.
4. How conventional software engineering differes from agile engineering?
5. Write about the general priciples of capabilty maturity model.
6. Explain the goals of data gathering process.
7. Why integration testing is harder than unit testing?

8. What are all the formulas available for calculating Cyclomatic complexity and Calculate cyclomatic complexity for greatest of three numbers.
9. Discover 4 increments that can be incorporated into word processing software by an incremental process model.
10. Compare Spiral and Win Win spiral model.

Analyse

1. Analyze the concept of CCPDS-R life cycle overview.
2. Categorize the various stages of COCOMO model.
3. Outline the various configuration Management functions and explain why CM is given very high priority in the industry.
4. Parse the knowledge required to develop an effective use case and justify.
5. Explain how Software Quality assurance Process differ from software development process and also expalin each phases of software quality program development.
6. Outline the contents of test plan.
7. Explain the framework of the quality assurance organization structures with neat diagram.

Evaluate

1. Determine the most effective software life cycle model for fastest application development.
2. Criticise on adapting reverse engineering.
3. Check whether testing of OO system is different from function oriented testing.
4. Determine the characteristics of software quality programs.
5. Categorize the software quality metrics.

Create

1. Develop a high level use case diagram for the given scenario:
    - Searching for books using an on-line bookstore
    - Buying a stock using an on-line brokerage account
2. Dramatize the concept of Inspection Data Analysis.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT305 DATA STRUCTURES AND ALGORITHMS 3 0 0 3

Course Objectives

- Study the recursion fundamentals, asymptotic notations and master the implementation of linked data structures such as linked lists and trees
- Familiarize with Hashing Techniques, Disjoint set ADTs and Graph algorithms

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Apply asymptotic notations for time and space complexity analysis and implement sorting and searching algorithms.
2. Design and implement linear data structures using any programming language to solve the computing problems.
3. Determine the appropriate tree ADT to solve and implement problems related to hierarchical structure.
4. Identify and analyze heap and hash functions for efficient storage of data.
5. Implement disjoint set ADT and graph algorithms to find the shortest path of the given graph.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1										2	3
2	2	3	2										2	1
3	1	2	3										3	1
4	3	2	2										1	3
5	2	2	3										2	3

UNIT I **9 Hours**

INTRODUCTION

Mathematics Review, Introduction to recursion, Asymptotic notations, sequential search, Binary Search - sorting algorithms: Insertion sort, shell sort, merge sort, quick sort.

UNIT II **9 Hours**

LINEAR DATA STRUCTURES

List ADT - Stack ADT - Queue ADT - Array and Linked Implementations - Applications.

UNIT III **9 Hours**

NON LINEAR DATA STRUCTURES

Binary Trees - Binary Search Tree - Adelson Velski Landis(AVL) Trees - Tree Traversals - B-Trees.

UNIT IV **9 Hours**

PRIORITY QUEUE AND HASHING

Priority Queue - Binary Heap - Heapsort - Hash functions - separate chaining, open addressing - rehasing - Extendible hashing.

UNIT V **9 Hours**

DISJOINT SET ADT AND GRAPH ALGORITHMS

Basic data structure - smart union algorithms - path compression - Topological sort - Shortest path algorithms - Minimum spanning tree.

FOR FURTHER READING

DFS Applications, Introduction to NP Completeness, Splay Trees, Red Black Trees.

Total: 45 Hours

Reference(s)

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 2015.
2. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, Introduction to Algorithms, Third Edition, MIT Press, 2014.
3. Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed, Fundamentals of Data Structures in C, Second Edition, Universities Press, 2008.
4. Gilberg, Data Structures: A Pseudocode Approach with C, Second Edition, Cengage Learning, 2007.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1						4					10														14
2						2	5				15				5										27
3						2	5				15														22
4						4					10				5										19
5						3					10			5											18
Total																									100

Assessment Questions

Remember

1. How do you represent a binary tree in the form of an array?
2. Define push and pop operations of stack ADT.
3. State the time complexity of insertion sort, merge sort and quick sort algorithms.
4. What is big O notation?
5. What is an ADT?
6. Define stack
7. List the areas in which data structures are applied extensively.
8. What is a linear data structure?
9. What is a non-linear data structure?
10. What is a data structure?

Understand

1. Inappropriate use of recursion will result in infinite execution. Justify with an example recursion code.
2. Why recursive algorithms are efficient than non-recursive algorithms?
3. What is the minimum number of queues needed to implement the priority queue?
4. Describe a situation where storing items in an array is clearly better than storing items on a linked list
5. Write a class definition that could be used to define a node in a doubly linked list. Include only the instance variables, not the methods. Also write one sentence to describe a situation when a doubly linked list is appropriate.
6. How many different trees are possible with 10 nodes?
7. What is the suitable data structure for constructing a tree?
8. Classify the Hashing Functions based on the methods by which the key value is found.

Apply

1. Design an algorithm to sort a given set of elements using priority queue.
2. Write a pseudo code to compute the power of a given number using recursion
3. Insert the following elements into an empty binary search tree and then perform left rotation with respect the root: 3,7,4,8,2,9,0,11. Show the resultant tree.
4. Insert the following elements into an empty hash table of size 13. Use separate chaining for collision resolution. 364, 564, 383, 679, 457, 586, 232, 563, 193
5. Find the shortest path from A to all other vertices for the following graph:(A,B,5), (A,C,3), (B,C,2), (B,E,3), (B,G,1), (C,D,7), (C E,7), (D,A,2), (D,F,6), (E, F, 7), (E,D,2), (G,E,1). Read the graph as(start vertex, end vertex, distance)
6. Design an algorithm to carry out deletion operation in binary search tree
7. The preorder traversal sequence of a binary search tree is 30, 20, 10, 15, 25, 23, 39, 35, 42. Find the postorder traversal sequence of the same tree?
8. Given a list of elements 12, 45, 56, 89, 78, 125,01, 3, 47, 555, 999, 99, 21 trace the steps to sort them using bubble sort algorithm
9. Define an AVL tree. Obtain an AVL tree by inserting one integer at a time in the following sequence. 150, 155, 160, 115, 110, 140, 120, 145, 130, 147, 170, 180. Show all the steps
10. Demonstrate Djikstra‘s algorithm to find the shortest distance in a weighted graph

Analyse

1. Write a function that takes the root node pointer of a singly linked list as input and returns the middle node pointer. Inside the function, the linked list should be traversed only once.
2. If the hash table size is not prime, it is possible to run out of alternative locations prematurely. Illustrate with the help of an example.
3. Distinguish DFS and BFS.
4. Compare linear and binary search
5. Contrast ADT implementation of array and linked list
6. Compare internal and external sorting

Evaluate

1. Evaluate the best case and worst case complexity for searching algorithms.
2. Can stack be used to perform queue operations? Justify
3. Explain the Basic operations performed in a Binary heap. Construct a Min and MAX heap for the following values.23,67,1,45,7,89,56,35
4. Summarize the concept of Huffman algorithm for constructing an optimal prefix code.Â Apply the algorithm and find the code for the following data: (a, 300), (b, 384), (c, 77), (d, 34), (e, 23).Â Read the input as (character, frequency).

Create

1. Develop an algorithm for Minimax tic-tac-toe algorithm with alpha-beta pruning using backtracking strategy.
2. Develop an application using a stack /Queue /List /Tree that reflects a real world problem.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT306 JAVA PROGRAMMING 3 0 2 4

Course Objectives

- Design, write, debug and run java programs using JDK tools
- Develop applications to manipulate the data available in databases using database connectivity and Java library
- Develop applications to manipulate the data available in databases using Java and SQL

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Apply object oriented programming concepts to implement basic IT related problems using NetBeans tool.
2. Develop applications using suitable data structures on collection classes and Java I/O classes and interfaces.
3. Develop applications to manipulate the data available in databases using Java and SQL
4. Create event-driven GUI applications using event handling mechanisms and swings
5. Build programs that run on multi-core environments using multi-threaded programming concepts

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1	1										
2	1	2	1	1										
3	1	2	3		1									
4	1	2	2								2		-	
5	1	2	2											

UNIT I **11 Hours**

BASICS OF JAVA

Overview of Java - Data Types, Variables, and Operators - Control Structures - Arrays - Classes - Objects Methods - Nested Classes - Primitive type Wrappers - Inheritance - Method overriding - Abstract Classes - Interfaces - Packages and Exception Handling.

UNIT II **7 Hours**

GENERIC PROGRAMMING AND I/O STREAMS

Generics Types - Generic Classes and Methods - Wild Cards and Type Erasure - Restrictions on Generics - Collection classes: Array List, HashMap, HashTable, Linked List, Vector, Garbage Collection - I/O Classes and Interfaces - File - The Byte Streams - The Character Streams - Using Stream I/O - Serialization.

UNIT III **8 Hours**

JAVA LIBRARY

Enumerations - Autoboxing - Annotations- Assertion - Lambda Expressions - String Handling - Special String operations and Methods - String Buffer, String Builder - System - Math - Date and Time - Formatter - Database Connectivity - Basics of Networking.

UNIT IV **10 Hours**

EVENT HANDLING

Applets - Event Handling Listener interfaces - Event Classes - Event Listeners - Adapter classes - AWT Controls - Introduction to Swing - Model - View-Controller - design pattern - buttons - Layout management - Swing Components - Simple Applications using Swing.

UNIT V **9 Hours**

CONCURRENT PROGRAMMING

Multi-threaded programming - Life Cycle of a Thread - Creating Threads - Synchronization - Deadlock - Inter-thread Communication - Interrupting Threads - Concurrency Utilities - Executors - Parallel programming via Fork/Join Framework.

FOR FURTHER READING

Note pad application- Standalone applications using java - Implementing algorithms using java - Reflection

1 **4 Hours**

EXPERIMENT 1

Programs using class and methods

2 **3 Hours**

EXPERIMENT 2

Inheritance implementation

3 **3 Hours**

EXPERIMENT 3

Inheritance via Interface and Abstract class

4 **4 Hours**

EXPERIMENT 4

Programs on Package implementations

5 **4 Hours**

EXPERIMENT 5

Applications using Generic collections

6 **4 Hours**

EXPERIMENT 6

File Handling using IO streams

7 **4 Hours**

EXPERIMENT 7

Desktop applications using Swing

8 **4 Hours**

EXPERIMENT 8

Multi-threaded Programming

Total: 75 Hours

Reference(s)

1. Herbert Schildt, Java: The Complete Reference, 9th Edition, McGraw Hill Education, 2014.
2. Cay S Horstmann, Gary Cornell, Core Java Volume - I Fundamentals,9th Edition, Prentice Hall, 2013.
3. Cay S Horstmann, Gary Cornell, Core Java Volume - II Advanced Features,9th Edition, Prentice Hall, 2013.
4. Kathy Sierra, Bert Bates, OCA/OCP Java SE 7 Programmer I and II Study Guide, First edition, McGraw Hill Education, 2014.
5. Rajkumar Buyya, S Thamarai Selvi, Xingchen Chu, Object Oriented Programming with Java: Essentials and Applications, Tata McGraw Hill Education Private Limited, 2009.
6. Bert Bates, Kathy Sierra, Head First Java, 2nd Edition, OReilly Media, 2005.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1			2								12											6			20
2		6					2				12														20
3			2			2									6				6			4			20
4			2			2									6				6			4			20
5						2									12								6		20
Total																									100

Assessment Questions

Remember

1. What is the return type of a method that does not returns any value? a) void b) float c) int d) double
2. Define the term serialization in java.
3. Select all the correct statements regarding Enums
   a) All enums are subclasses of interface java.lang.Enum.
   b) Enums is simply a data structure and hence it is not compiled to a .class file.
   c) Enums enable you to define a new data type. For example, If you create an Enum 'Days' you can declare a variable of type 'Days'.

d) All instances of Enums are serializable by default.

4. Define Enumerations.
5. List the types of drivers availble for connecting database with java.
6. List the methods declared under KeyListener interface in java event handling.
7. List the four types of layouts supported in AWT.
8. List the methods associated with Thread class.
9. Depict the diagram of complete life cycle of a thread.
10. _____ is a standard collection class which implements a dynamic array.a)AbstractList b)LinkedList c)ArrayList d)AbstractSet

Understand

1. Classify the types of control structures based on the flow of execution
2. Compare method overlaoding and method overriding concepts in java.
3. Summarize the collection classes available in java.
4. Explain the concept of erasure in generics.
5. Identify the two ways of registering a driver in JDBC.
6. Illustrate the types of constructors used by the String Class using an example program.
7. Identify the difference between paint and repaint methods in applets.
8. Explain the event hanlding mechanism in java.
9. Classify the two ways of creating thread in java.
10. Compare process based system with thread based system.

Apply

1. Predict the output for the following code segement.

```
public class Test
{
public static void main(String[] args)
{
 int j = 5;
 for (int i = 0; i< j; i++)
 {
 if ( i < j-- )
 System.out.print(Â (i*j)Â + " ");
 }
}
}
```

2. Demonstrate the use of for each statment for the following array.
   String[] name = {"Ram","Sundar","Nisha","Veena","Kamal"};
3. Use PushbackReader class to show how a programming language parser can use a pushback stream to deal with the difference between the == operator for comparison and the = operator for assignment.
4. Design a simple generic version of method *isEqualTo* that compares its two arguments with the *equals* method and returns *true* if they're equal and *false* otherwise. Use this generic method in a program that calls *isEqualTo* with a variety of built-in types, such as *Object* or *Integer*.
5. Apply the String method regionMatches to compare two strings input by the user. The program should input the number of characters to be compared and the starting index of the comparison. The program should state whether the first string is less than, equal to or greater than the second string. Ignore the case of the characters when performing the comparison.
6. Implement a very simpleÂ client and serverÂ network communication using Datagram to send a message from server to Client.
7. Design an applet that uses showstatus() to display the name of the current month, day, and year.
8. Implement the mouseclicked and mouseentered methods availble in Mouselistener interface in a class called MouseDemo. Test the class using user input.

9. Develop an application that executes two threads. one thread dispalys " Welcome" every 1000 milliseconds, and other displays "BIT" every 2000 milliseconds. Create the threads by extending the Thread Class.
10. Write a multithreaded that simulates a set of grasshoppers jumping around in a box. Each grasshopper jumps to a different location every 2 to 10 seonds . Display the new location of grasshopper after each of these jumps.

Analyse

1. Interface provides 100% pure abstraction compared with Abstract class. Justify the answer with Example
2. How do you determine type of Object Generics variable is using at run-time"?
3. If Serialization is not used, is it possible to persist or transfer an object using any other approach?
4. Compare the pros and cons of String, StringBuffer and StringBulider classes in java.
5. Is it possible to create option button using AWT controls? Explain
6. What happens if an exception is generated in a synchronized method or statement block?Explain.
7. Is it possible to execute to methods simultaneously in java? Resolve the soultion.

Evaluate

1. String is immuable in java. Justify the answer.
2. An event-listener interface defines the methods that must be implemented by an event handler for a particular kind of event. But most of application's require only few methods . How can we overcome this drawback?

Create

1. Generate a java code to simulate the operation of a calculator.
2. Create an applet program that calculates the age of person interms of year , month and days .

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15IT307 DIGITAL SYSTEM DESIGN LABORATORY 0 0 2 1

Course Objectives

- Design, analyze and test simple combinational logic using basic gates
- Analyze and design basic sequential logic circuits for various applications

Programme Outcomes (POs)

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. Implement the circuit for conversion of number system from binary to gray,gray to excess 3 and vice versa
2. Design and Implement combinational logic circuits containing decoder, multiplexer, demultiplexer and adder
3. analyse, design, build and debug complex and sequential circuit for the given specification
4. Construct the synchronous sequential circuits by using the functionality of registers, flip-flops, and counters.
5. Implementation of simple combinational and sequential circuit using HDL

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		3	2		1						3			
2		3			2	2			3					
3		2		3			2		3					
4		3	2			-	1		3		2			
5			3				1		3					

1 **3 Hours**

EXPERIMENT 1

Design and Implementation of Code Converter

2 **3 Hours**

EXPERIMENT 2

Design of 4-bit Adder and Subtractor

3 **3 Hours**

EXPERIMENT 3

Design and Implementation of Multiplexer and Demultiplexer

4 **3 Hours**

EXPERIMENT 4

Design and Implementation of Encoder and Decoder

5 **3 Hours**

EXPERIMENT 5

Construction and Verification of Ripple Counter

6 **3 Hours**

EXPERIMENT 6

Design and Implementation of Synchronous UP/Down Counter

7 **4 Hours**

EXPERIMENT 7

Design and Implementation of Shift Register

8 **4 Hours**

EXPERIMENT 8

Implementation of simple combinational circuit using HDL

9 **4 Hours**

EXPERIMENT 9

Implementation of simple sequential circuit using HDL

Total: 30 Hours

Evaluation Pattern

Preparation / Pre 10	5
Experiment & Results / E&R 10	10
Record / Observation / RO 10	5
Test -Cycle I / TCI 50	15
Test-Cycle II / TCII 50	15

15IT308 DATA STRUCTURES AND ALGORITHMS LABORATORY

0 0 2 1

Course Objectives

- Familiarize students in the implementation of searching algorithms, sorting algorithms, linear & non linear data structures.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Apply appropriate algorithm for solving problems like sorting,searching.
2. Design and analyze the time to create and perform operations on Linear data structures (list, stack & queue) and non linear data structures (trees and graphs).
3. Construct programs for fundamental algorithmic problems including Tree Traversals, Graph traversals and shortest paths.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3											2	
2	2	2		3									1	
3		2	3										2	

1 **4 Hours**

EXPERIMENT 1

Implementation of Searching Algorithms

2 **4 Hours**

EXPERIMENT 2

Implementation of sorting algorithms

3 **5 Hours**

EXPERIMENT 3

Implementation of LIST ADT using Array and Linked Representation

4 **4 Hours**

EXPERIMENT 4
Implementation of Stack ADT using Arrays and Linked list

5 **4 Hours**

EXPERIMENT 5
Implementation of Queue ADT

6 **4 Hours**

EXPERIMENT 6
Implementation of Trees

7 **5 Hours**

EXPERIMENT 7
Implementation of Graph Algorithms

Total: 30 Hours

Evaluation Pattern

Preparation / Pre 10	5
Experiment & Results / E&R 10	10
Record / Observation / RO 10	5
Test -Cycle I / TCI 50	15
Test-Cycle II / TCII 50	15

15IT309 MINI PROJECT I 0 0 2 1

Course Objectives

- Demonstrate the ability to use simple data structures and algorithms
- Understand simple sequential/combinational logic circuits using basic gates
- Design, write, debug and run java programs using JDK tools

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies
3. Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project
4. Test and validate through conformance of the developed prototype and analysis the cost effectiveness
5. Prepare report and present oral demonstrations

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		3	2			2	1							
2	2	2	1	3		2					2	2		
3			3	2	2			2			2	2		
4		1		2	3	1	2	2						
5									3	3		2		

Total: 0 Hours

Evaluation Pattern

Review I / RI 25	25
Review II / R 25	25
Report / Report 50	25
Presentation&Viva Voce / PVV 50	25

15GE310 LIFE SKILLS: BUSINESS ENGLISH 0 0 2 0

Course Objectives

- To acquire command in both the receptive skills (Listening and Reading)and the productive skills(Writing and Speaking) of English language
- Employ various types of sentences in business correspondence
- To acquire language skills needed for B2 level of the CEFR/ Common European Framework of Reference for Languages

ProgrammeOutcomes(POs)
Course Outcomes (COs)

1. Listen to business conversations and understand specific information and overall idea
2. Read and understand business texts
3. Write coherent business letters, e-mails and reports using appropriate sentence structures and cohesive devices
4. Communicate orally in business situations using necessary verbal and non verbal devices
5. Appear for the Business English Certificate (BEC)Vantage level examination conducted by Cambridge Assessment English

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	1	2												
3	1	2												
4	1													
5		3												

1 **15 Hours**

UNIT I LISTENING AND READING

Listening for writing short answers - filling gaps in Listening for writing short answers - filling gaps in sentences - identifying topic, context and function - identify different functions of language in business situations - identify prompts -identify paraphrases of required information Scanning - reading for gist - understanding sentence structure - error identification - identify paraphrases - cohesive words and phrases - understand the importance of analysing the distractors - identify grammatical and semantic relationships

2 **15 Hours**

UNIT II WRITING AND SPEAKING

Business Emails - notes - memos to colleagues or friends - Giving instructions - explaining a development - asking for comments - requesting information - agreeing to requests - explaining - apologising - reassuring - complaining - describing - summarising - recommending - persuading Turn-taking - sustaining interaction - initiating - responding - giving personal information - Talking about present circumstances, past experiences and future plans - expressing opinion - speculating - organising a larger unit of discourse - giving information - expressing and justifying opinions - speculating - comparing and contrasting - agreeing and disagreeing

Total: 30 Hours

Reference(s)

1. Whitehead, Russell and Michael Black. Pass Cambridge BEC Vantage Self-Study Practice Tests with Key, Heinle,a part of Cengage Learning, Delhi, 2003.

Evaluation Pattern

Periodical Test II / PT2 50 Periodical Test I / PT1 50	50
Final Examination (LS) / FLS 100	50

15MA404 DISCRETE MATHEMATICS 2 2 0 3

Course Objectives

- By enrolling and studying this course the students will be able to understand the notion of mathematical thinking, mathematical proofs and be able to apply them in problem solving.
- Understand and use the terms Cardinality, finite, countably infinite and uncountably infinite, and determine which of these characteristics is associated with a given set.
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Formulate short proofs using the following methods: direct proof, indirect proof and proof by contradiction
2. Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions and integers.
3. Apply the different properties of injection, surjection, bijection, composition and inverse functions
4. Demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability
5. Demonstrate abstract algebra, posets, lattices, Boolean algebra and their application in information Technology

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	1	2												
3	1	2												
4	1	2												
5	1	2												

UNIT I **6 Hours**

PROPOSITIONAL CALCULUS

Propositions- Logical connectives-Truth tables - Tautologies and Contradictions - Logical and equivalences and implications-De Morgan's Laws-Normal forms-Principal conjunctive and disjunctive normal forms - Rules of inference -Validity of arguments.

UNIT II **5 Hours**

PREDICATE CALCULUS

Predicates-Statement Function - Variables-free and bound variables- Quantifiers-Universe of discourse-Logical equivalences and implications for quantified statements- Theory of inference- The rules of universal specification and generalization-Validity of arguments.

UNIT III **6 Hours**

SET THEORY AND FUNCTIONS

Set Operations-properties-Power set-Relations- Partial Ordering- Equivalence relations- Functions - Types of Functions- composition of relation and functions- inverse functions.

UNIT IV **7 Hours**

COMBINATORICS

Basics of Counting - Counting arguments- Pigeonhole Principle- Permutations and Combinations- Recurrence relations - Solving linear recurrence relations -Generating Functions.

UNIT V **6 Hours**

LATTICES AND BOOLEAN ALGEBRA

Partial ordering - Posets - Lattices as Posets- Properties of lattices- Lattices as Algebraic systems - Sub lattices- Direct product and homomorphism - Some special lattices - Boolean algebra.

FOR FURTHER READING

Boolean expression from logic and switching network, Logic gate and switching circuit.

Total: 60 Hours

Reference(s)

1. Kenneth H Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, Seventh Edition, McGraw Hill Education India Private Limited, New Delhi, 2013.
2. C.L.Liu, Elements of Discrete Mathematics, Tata McGraw Hill, New Delhi, 2000.
3. A.Doerr and K.Levasseur, Applied Discrete Structures, Galgotia Publication, New Delhi, 2004.
4. B.Kolman, R.C.Busby and S.C.Ross, Discrete Mathematical Structures, Fifth Edition, Pearson Education, New Delhi, 2005.
5. Johnsonbaugh, Richard, Discrete Mathematics, Sixth Edition, Maxwell, International Edition, 2006.
6. P.RalphGrimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, Pearson Education Asia, New Delhi, 2002.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	1	2			1	6				2	6														18
2	2				2	2					6		2	2											16
3	1	1			1	2			1					2	6				6						20
4		2					6		2		12														22
5	1				1	2	4		2	6			2						6						24
Total																									100

Assessment Questions
Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT402 DATABASE MANAGEMENT SYSTEMS 3 0 0 3

Course Objectives

- Understand functional components of the DBMS
- Understand need for concurrency and transaction property
- Compare and contrast various indexing strategies in different database systems

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Identify and analyze the essential concepts and key issues involved in the design of a database
2. Apply the database queries with appropriate key and integrity constraints to design a database
3. Apply the concepts of normalization and ER model to guarantee an efficient database
4. Analyze the concurrent execution of transaction process and various recoveries from failures
5. Apply indexing and query optimization techniques for a database design

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	1	2	3		1								1	
3	1	2	3											1
4	1	3												
5	1	3	2											

UNIT I **7 Hours**

INTRODUCTION TO DATABASE SYSTEMS

Evolution of Database and DBMS - Need for data management - Data models and Database Architecture - Professions in DBMS - Key issues and challenges in Database Systems-Database Applications.

UNIT II **10 Hours**

DATA DEFINITION AND QUERYING

Data Definition Language (DDL) and Data Manipulation Language (DML) - Basic Operations - Set Operations - Null Values - Modification of Database - Aggregate Functions - Nested Subqueries - Transactions - Integrity Constraints - SQL Data Types and Schemas - Authorization - Joins - Views - Triggers

UNIT III **10 Hours**

ER AND RELATIONAL MODELS

ER Diagrams - Relational Model - ER to Relational Mapping - Constraints - Keys - Dependencies - Relational Algebra - Normalisation - First, Second, Third and Fourth Normal Forms - BCNF - Join Dependencies.

UNIT IV **9 Hours**

TRANSACTIONS AND CONCURRENCY

Introduction to Transactions - Transaction Systems - ACID Properties - System and Media Recovery - Two Phase Commit Protocol - Recovery with SQL - Need for Concurrency - Locking Protocols - Deadlocks and Managing Deadlocks - SQL Support for Concurrency.

UNIT V **9 Hours**

INDEXING AND DATABASE OPTIMIZATION

Indexing and Hashing Techniques - B-Tree - B+ Tree - Query Processing and Optimization - Sorting and Joins - Database tuning.

FOR FURTHER READING

Spatial and Temporal Databases - Mobile Databases - Multimedia and Web Databases.

Total: 45 Hours

Reference(s)

1. Abraham Silberschatz, Henry F Korth, S Sudharshan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2014.
2. Ramez Elmasri, Shamkant B Navathe, Fundamentals of Database Systems, Seventh Edition, Pearson Education, 2015.
3. Raghu Ramakrishnan, Database Management Systems, Third Edition, McGraw Hill, 2012.
4. Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom, Database Systems: The Complete Book, Second Edition,Pearson Education, 2012.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	2				12	4																		20
2		2				2					12								4						20
3		2				2													4				12		20
4		2				2									4			12							20
5		2				2					4								12						20
Total																									100

Assessment Questions

Remember

1. List six major steps that you would take in setting up a database for a particular enterprise.
2. Give an example of an update that is neither speeded up nor slowed down by the indexes.
3. Relate DBMS and RDBMS.

4. Define the two principal integrity rules for the relational model.
5. Show that a query using the HAVING clause has an equivalent formulation without a HAVING clause.
6. Define the purpose and tasks associated with data administration and database administration.
7. State the transformation rules that apply to:
   (a) Selection operations
   (b) Projection operations
   (c) Theta join operations.
8. Relate ACID property of transaction with real world scenario.
9. Name the typical phases of query processing.
10. List the three design goals for relational databases, and explain why each is desirable.

Understand

1. Discuss insertion, deletion, and modification anomalies. Why are they considered bad? Illustrate with examples.
2. Illustrate how the Database administrator and various users communicate to the database in the context of query processing and storage managing.
3. Explain the distinction between closed and open hashing. Discuss the relative merits of each technique in database applications.
4. Give an example of a serializable schedule with two transactions such that the order in which the transactions commit is different from the serialization order.
5. Consider a database for an airline where the database system uses snapshot isolation. Describe a particular scenario in which a nonserializable execution occurs, but the airline may be willing to accept it in order to gain better overall performance.
6. Since every conflict-serializable schedule is view serializable, why do we emphasize conflict serializability rather than view serializability?
7. If we assume that the DBA is never interested in running his or her own queries, does the DBA still need to understand query optimization? Justify your answer
8. Describe the structure of a DBMS. If your operating system is upgraded to support some new functions on OS files (e.g., the ability to force some sequence of bytes to disk), which layer(s) of the DBMS would you have to rewrite to take advantage of these new functions?
9. If a query language is relationally complete, can you write any desired query in that language?
10. Consider a relation stored as a randomly ordered file for which the only index is an unclustered index on a field called sal. If you want to retrieve all records with sal > 20, is using the index always the best alternative? Explain.

Apply

1. Consider the universal relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies $F = \{ \{A, B\} \rightarrow \{C\}, \{A\} \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \{F\} \rightarrow \{G,H\}, \{D\} \rightarrow \{I, J\} \}$. What is the key for R? Decompose R into 2NF and then 3NF relations.
2. Consider the following relation for published books:
   BOOK (Book_title, Author_name, Book_type, List_price, Author_affil, Publisher)
   Author_affil refers to the affiliation of author. Suppose the following dependencies exist:
   Book_title →Publisher, Book_type
   Book_type →List_price
   Author_name → Author_affil
   a. What normal form is the relation in?
   b. Apply normalization until you cannot decompose the relations further.
3. Supreme Products manufactures products like pressure cookers, cookwares, water purifiers, food processors etc. The company markets its products to wholesalers all over the country and dealers sell them to customer. The company has five regional offices and many sales persons are attached to regional offices. Salespersons contact dealers and explain about products, incentives offered, training programs for wholesalers and demo for customers etc. Dealers place orders with the salespersons attached with the regional office of their location. After receiving goods they make payments, which may be in installments. Company would like to

develop a system to monitor sales of different products, performance of salespersons and orders from wholesalers.
Do the following :
(i) Identify entities, attribute and relationships giving functionalities and draw E-R diagram for the system.
(ii) Convert this to relational tables explaining logic involved.

4. Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted.
5. Consider the following relational database
   employee (employee name, street, city)
   works (employee name, company name, salary)
   company (company name, city)
   manages (employee name, manager name)
   Give an expression in SQL for each of the following queries.
   a. Find the names of all employees who work for "First Bank Corporation".
   b. Find all employees in the database who live in the same cities as the companies for which they work.
   c. Find all employees in the database who live in the same cities and on the same streets as do theirmanagers.
6. Let relations r1(A, B,C) and r2(C, D, E) have the following properties: r1 has 20,000 tuples, r2 has 45,000 tuples, 25 tuples of r1 fit on one block, and 30 tuples of r2 fit on one block. Estimate the number of block transfers and seeks required, using each of the following join strategies for r1 r2:
   a. Nested-loop join.
   b. Block nested-loop join.
   c. Merge join.
   d. Hash join.
7. Consider the following two transactions:
   T13: read(A);
   read(B);
   if A = 0 then B := B + 1;
   write(B).
   T14: read(B);
   read(A);
   if B = 0 then A := A + 1;
   write(A).
   Let the consistency requirement be A = 0 ⊢ B = 0, with A = B = 0 the initial values.
   a. Show that every serial execution involving these two transactions preserves the consistency of the database.
   b. Show a concurrent execution of T13 and T14 that produces a nonserializable schedule.
   c. Is there a concurrent execution of T13 and T14 that produces a serializable schedule?
8. Consider the following tables:
   Employee (Emp_no, Name, Emp_city)
   Company (Emp_no, Company_name, Salary)
   i. Write a SQL query to display Employee name and company name.
   ii. Write a SQL query to display employee name, employee city, company name and salary of all the employees whose salary >10000
   iii. Write a query to display all the employees working in 'XYZ' company.
9. Normalize the following schema, with given constraints, to 4NF.
   books(accessionno, isbn, title, author, publisher)
   users(userid, name, deptid, deptname)
   accessionno→isbn
   isbn→title
   isbn→publisher
   isbn→→author

userid→name
userid→deptid
deptid→deptname

10. For a simple BBS (Bulletin Board System) we use the following SQL statements to create two tables: one storing all posted messages and the other users who can post them.
CREATE TABLE Message (mesgid INTEGER, poster INTEGER,subject CHAR(50),body CHAR(255),
postdate DATETIME, PRIMARY KEY mesgid, FOREIGN KEY poster REFERENCES User (userid) ON
DELETE CASCADE ON UPDATE CASCADE) CREATE TABLE User (userid CHAR(50), password
CHAR(50), email CHAR(50), status CHAR(1), PRIMARY KEY(userid))
(a) There is an error in one of the above statements. Point out the error, explain why it is wrong and correct the error by rewriting that SQL statement.
(b) Suppose there is a user with userid John in the database who has posted 100 messages. What will the DBMS do if we delete John from table User? What if we change John's useridto Michael?
(c) Write an SQL statement to create a view of those messages with all their attributes that are posted by 'John'.
(d) Write an SQL statement to create a domain such that the status attribute can only take two values, i.e., 'j' and's'.

Analyse

1. Can data redundancy be completely eliminated in database approach? Why or why not?
2. Compare DDL, DML and DCL commands.
3. Suggest an efficient way to test if the bucket address table in extendable hashing can be reduced in size, by storing an extra count with the bucket address table. Give details of how the count should be maintained when buckets are split, coalesced, or deleted. (Note: Reducing the size of the bucket address table is an expensive operation, and subsequent inserts may cause the table to grow again. Therefore, it is best not to reduce the size as soon as it is possible to do so, but instead do it only if the number of index entries becomes small compared to the bucket-address-table size.)
4. Suppose that we are using extendable hashing on a file that contains records with the following search-key values:
2, 3, 5, 7, 11, 17, 19, 23, 29, 31
Show the extendable hash structure for this file if the hash function is h(x) = xmod 8 and buckets can hold three records.
5. Consider a disk with a sector size of 512 bytes, 2000 tracks per surface, 50 sectors per track, five double-sided platters, average seek time of 10 msec, and a block size of 1024 bytes is chosen. Suppose that a file containing 100,000 records of 100 bytes each is to be stored on such a disk and that no record is allowed to span two blocks.
a) How many records fit onto a block?
b) How many blocks are required to store the entire file? If the file is arranged sequentially on the disk, how many surfaces are needed?

Evaluate

1. Consider the following set *F* of functional dependencies on the relation schema
r (*A, B, C, D, E, F*):
A→BCD
BC→DE
B→D
D→A
a. Compute *B*+.
b. Prove (using Armstrong's axioms) that *AF* is a superkey.
c. Compute a canonical cover for the above set of functional dependencies

d. Give each step of your derivation with an explanation.
e. Give a 3NF decomposition of *r* based on the canonical cover.

2. Prove that any relation schema with two attributes is in BCNF.
3. Consider the following relational database
   employee (person name, street, city)
   works (person name, company name, salary)
   company (company name, city)
   Give an expression in the relational algebra to express each of the following queries:
   a. Find the names of all employees who live in city "Miami".
   b. Find the names of all employees whose salary is greater than $100,000.
   c. Find the names of all employees who live in "Miami" and whose salary is greater than $100,000.
4. Prove that a functional dependency satisfies the formal definition of multivalued dependency.
5. Modify the data structures for multiple-mode locks and the algorithms for read_lock(X), write_lock(X), and unlock(X) so that upgrading and downgrading of locks are possible.

Create

1. A multinational engineering company has decided to distribute its project management information at the regional level in mainland Britain. The current centralized relational schema is as follows:
   Employee (NIN, fName, lName, address, DOB, sex, salary, taxCode, deptNo)
   Department (deptNo, deptName, managerNIN, businessAreaNo, regionNo)
   Project (projNo, projName, contractPrice, projectManagerNIN, deptNo)
   WorksOn (NIN, projNo, hoursWorked)
   Business (businessAreaNo, businessAreaName)
   Region (regionNo, regionName)
   where Employee contains employee details and the national insurance number NIN is the key. Department contains department details and deptNo is the key. managerNIN identifies the employee who is the manager of the department. There is only one manager for each department.
   Project contains details of the projects in the company and the key is projNo. The project manager is identified by the projectManagerNIN, and the department responsible for the project by deptNo.
   WorksOn contains details of the hours worked by employees on each project and (NIN, projNo) forms the key.
   Business contains names of the business areas and the key is businessAreaNo.
   Region contains names of the regions and the key is regionNo.
   Departments are grouped regionally as follows:
   Region 1: Scotland Region 2: Wales Region 3: England
   Information is required by business area, which covers: Software Engineering, Mechanical Engineering, and Electrical Engineering. There is no Software Engineering in Wales and all Electrical Engineering departments are in England. Projects are staffed by local department offices.
   As well as distributing the data regionally, there is an additional requirement to access the employee data either by personal information (by Personnel) or by work related information (by Payroll).
   a) Buid an Entity–Relationship (ER) diagram to represent this system.
   b) Using the ER diagram, produce a elational database design for this system
2. Construct a B+-tree for the following set of key values:
   (2, 3, 5, 7, 11, 17, 19, 23, 29, 31)
   Assume that the tree is initially empty and values are added in ascending order.
   Construct B+-trees for the cases where the number of pointers that will fit in one node is as follows:
   a. Four
   b. Six
   c. Eight

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT403 OBJECT ORIENTED ANALYSIS AND DESIGN **2 0 2 3**

Course Objectives

- Study about the object oriented system development life cycle
- Learn various object oriented methodologies and Unified Modeling Language (UML)
- Analyze and design the object oriented classes to develop quality software

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Compare the capabilities of object oriented approach with the traditional approach and exploit it for building high quality software design
2. Design a model for real world applications using unified modelling language with appropriate object oriented methodologies
3. Perform requirement analysis for a real world application using use-case diagrams
4. Design a database based on object oriented design process and exhibit the storage with Interoperability
5. Design and test the user interface for the real world application

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3				1	-								
2		3			2						1	1		
3		3	2	1	1						1			
4			3	2	1						1			
5		2	3								1			

UNIT I **3 Hours**

INTRODUCTION

Object Basics - Object Oriented Systems Development Life Cycle - The software development process.

UNIT II **7 Hours**

OBJECT ORIENTED METHODOLOGIES

Rumbaugh Methodology - Booch Methodology - Jacobson Methodology - Unified Approach - Unified Modeling Language - UML diagrams for modeling.

UNIT III **6 Hours**

OBJECT ORIENTED ANALYSIS

Identifying use cases - Object Analysis- Classification - Approaches for Identifying Classes - Identifying Object relationships.

UNIT IV **7 Hours**

OBJECT ORIENTED DESIGN

Object Oriented Design Axioms - Designing Classes - Class visibility - Redefining attributes - Designing methods and protocols - Packages and managing classes - Access Layer.

UNIT V **7 Hours**

SOFTWARE QUALITY AND USABILITY

Designing Interface Objects - User Interface Design as a creative process - Designing view layer classes - Macro level process - Micro level process-The Purpose of view layer interface - Prototyping the user interface - Software Quality Assurance - System Usability.

FOR FURTHER READING

Building high quality software - Frameworks - Measuring User Satisfaction.

1 **3 Hours**

EXPERIMENT 1

Program Analysis and Project Planning

2 **5 Hours**

EXPERIMENT 2

Software requirement Analysis

3 **6 Hours**

EXPERIMENT 3

Data modeling using Unified Modeling Language

4 **12 Hours**

EXPERIMENT 4

Software Development and Debugging

5 **4 Hours**

EXPERIMENT 5

Software Testing using various testing tools

Total: 60 Hours

Reference(s)

1. Ali Bahrami, Object Oriented Systems Development, Third Edition, Tata McGraw-Hill, 2012
2. Mahesh P Matha, Object Oriented Analysis and Design Using UML, PHI, 2012
3. Martin Fowler, UML Distilled, Pearson Education, Second Edition, 2009
4. James Rumbaugh, Ivar Jacobson and Grady Booch The Unified Modeling Language Reference: Manual, Addison Wesley, Third Edition, 2008
5. Hans-Erik Eriksson, Magnus Penker, Brain Lyons and David Fado, UML Toolkit, OMG Press Wiley Publishing Inc., 2010

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	6	2				4	2								2										16
2		2	4				4				6											2	4		22
3	2	2			6		4							6											20
4	2					6					2							4	4				4		22
5	2					4	2			2					6			4							20
Total																									100

Assessment Questions

Remember

1. Recognize the two orthogonal views of the software.
2. Define use cases.
3. State the 80-20 rule.
4. Interpret the four phases in OMT.
5. Enlist out the 4 steps for finding the attributes of a class.
6. Define pattern mining. Give the steps involved in capturing pattern.
7. LabelÂ the main activities in design process.
8. List the guidelines for developing quality assurance test cases.
9. Suppose you are a test manager, what are the milestones you would select for unit, integration test plans? what should be included in the milestone reportÂ for testing ?
10. Elucidate the basic concepts of Unified Modeling Language.

Understand

1. Identify attributes and methods of a dishwasher object.
2. Comprehend the steps required to build high quality software?
3. Differentiate between the <extend> and <> relationship in the usecase diagram.
4. What are the various diagrams that are used in analysis and design steps of Booch Methodology?
5. How is recursion represented in a sequence diagram?
6. Explain the steps involved in Identifying Classes and their behaviors through Sequence modeling ?
7. Discuss about the usability testing in detail and give the guidelines for developing it.
8. Elaborate the process of designing view layer classes.
9. Describe about 1-to-many relationships between classes
10. What do you mean by aggregation? What are the major properties of a-part-of relation?

Apply

1. Choose an area of commercial activity (business, industry, government agency, etc.)with which you are familiar. Identify some ways in which products show the use of generalization and some ways that components used as inputs. Show the use of generalization.
2. Show the incorporation of users needs into the system development process.
3. Sketch UML diagrams for Telephone Billing System

4. A master student shall be modelled using a UML diagram. A student can be asleep or awake. A woken student can be at the TUHH, at home, i.e. in his room, in the kitchen and in the bathroom. Which diagram type would you use to describe this? Draw a diagram for this. There are two different types of interaction diagrams: sequence and collaboration diagrams. Compare the two types of diagrams. What are the key differences between those diagram types considering their characteristics and their application?
5. Illustrate about the different models involved in designing access layer.
6. Identify the attributes and methods of a dishwasher object and explain the process flow with neat diagram.
7. With an example explain how use case modeling is used to describe functional requirements. Identify the actors, scenarios and use cases.
8. Explain how the steps will differ for identifying Class through sequence and collaboration modeling?
9. Consider the Hospital Management system application with the following requirements
   (i) System should handle the in-patient,out- patient information through receptionist.
   (ii) Doctors are allowed to view the patient history and give their prescription
   (iii) There should be a information system to provide the required information
   Give the state chart, component and deployment diagrams
10. Model the relationship between a car (that has an engine and a color) and its owners (having a name) inÂ a UML class diagram. A car can have several owners over time, but only one or none owner at a time.

Analyse

1. Lee Turner is director of information systems (IS) for the city of Providence. The IS department customer are the public library ,the fire department ,the police department ,the finance department ,the sanitation department and the water department .Lee belives close communication with these customers is the key t meeting their needs. Currently, the police and fire department need fast access to a map of the city for dispatching the city ambulance and fire trucks to accident sites.Identify the actors.
2. Elucidate the needs of building high quality software and how it is useful in various real time applications.
3. How can we build a high quality Software? Explain.
4. Give detailed notes about the Noun phrase approach,and apply the same to eliminate unwanted classes in Aircraft Maintanence System
5. Illustrate with an example,the relationship between sequence diagram and use cases

Evaluate

1. Evaluate the activities involved in access layer design process?
2. Classify the following UML diagram types as static or dynamic diagram types
   Class diagram.
   State diagram
   Sequence diagram.
   Interaction diagram.
   Use case diagram.
   Package diagram.
   Deployment diagram
   Justify Â for each diagram why it is a static or dynamic diagram type
3. Predict the steps to build a high quality Software.
4. Why user interface is one of the most important components of any software?
5. If you are in market to buy a car, which attributes or services are relevant to you

Create

1. Model the relationship between a car (that has an engine and a color) and its owners (having a name) in a UML class diagram. A car can have several owners over time, but only one or none owner at a time. Do not forget cardinalities, role names, attributes and their types.
2. Find out from your library about the coding system that is used for classifying books, videos, etc. Construct part of the structure in UML notation as a generalization hierarchy. Think up

some attributes for classes in your model to show how the lower levels are progressively more specialized.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15IT404 COMMUNICATION ENGINEERING 3 0 0 3

Course Objectives

- Understand the basic concepts of communication and its types
- Gain knowledge on various mobile communication technologies and their performances
- Understand the process of satellite and optical fiber communication

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Analyze the performance of AM,FM and PM systems
2. Analyze and design various pulse modulation schemes for the transmission of analog message signal
3. Analyze the performance of various digital modulation techniques
4. Compare and analyze different multiple access techniques used for wireless communication systems
5. Design the spread spectrum modulation schemes for secured communication

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1											
2	1	2	3											
3	1	2												
4		2	2											
5		2	3											1

UNIT I **9 Hours**

ANALOG COMMUNICATION

Elements of Communication systems - Basic principles of AM, FM and PM - Spectra - Power consideration - Receiver characteristics and detection of AM, FM and PM Systems performance.

UNIT II **9 Hours**

PULSE MODULATION

Sampling process - Pulse Amplitude modulation - Pulse width modulation - Pulse position modulation - Bandwidth Noise trade off - Quantization process - Pulse Code Modulation - Noise considerations in PCM systems - Time Division Multiplexing.

UNIT III **10 Hours**

DIGITAL MODULATION

Introduction to pass band data transmission - Pass band transmission model - Coherent binary modulation techniques: BPSK, QPSK - Coherent Quadrature modulation techniques: QAM - Non-coherent binary modulation: BFSK, DPSK - performance of digital modulation systems based on probability of error, band width.

UNIT IV **9 Hours**

MOBILE COMMUNICATION TECHNOLOGIES

Wireless Communication - Multiple access techniques in Mobile communication - TDMA, FDMA, CDMA, W-CDMA, OFDMA, GSM technologies - RAKE receiver for wireless communication using CDMA.

UNIT V **8 Hours**

SPREAD SPECTRUM MODULATION

Pseudo noise Sequences - A Notion of spread spectrum - Direct sequence spread spectrum - signal space dimensionality and processing gain - Probability of error - Frequency hopping spread spectrum.

FOR FURTHER READING

Survey on Satellite communication and optical Communication systems.

Total: 45 Hours

Reference(s)

1. Simon Haykin, Communication systems, John Wiley and Sons, 2013.
2. John Proakis, Massoud Salehi, Digital Communication, 5th Edition, McGraw-Hill, 2014.
3. Taub and Schilling, Principles of Communication systems, Tata McGraw Hill Publication, 2013.
4. K Sam Shanmugam, Digital and Analog Communication Systems, John Wiley, 2008.
5. A B Carlson, Communication Systems, McGraw-Hill, 2009.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	6	2				4	2								2										16
2		2	4				4				6											2	4		22
3	2	2			6	6	4							6											26
4	2					4					2							4	4				4		20
5	2						2			2					6			4							16
Total																									100

Assessment Questions

Remember

1. Define Modulation and specify the needs for modulation.
2. What are the advantages of single sideband transmission?
3. What is ISI?
4. Draw the functional model of Pass band data transmission system.
5. Define Digital Modulation.
6. List the types of digital modulation.
7. What are the suitable multiple access techniques for digital communication?
8. Give the primary advantage of spread spectrum communication.

9. Define processing gain
10. List the advantages of spread spectrum communication.

Understand

1. Give the expression for AM modulated wave.
2. What is slope overload distortion, and how it can be reduced?
3. How to avoid aliasing effect.
4. What is meant by quantization error?
5. With a block diagram, explain the adaptive Delta Modulation technique.
6. Which type of modulation technique is used to transmit analog signal in the form of digital pulses? What are the steps to be carried out for such modulation? Explain in detail.
7. Draw the channel allocation diagram in TDMA, FDMA and in CDMA.
8. List the various speech-coding techniques.
9. Explain in detail about the concept of TDMA with its frame structure and the characteristics.
10. Analyze the performance of Direct sequence spread coherent phase shift keying system based on interference and synchronization problem with its block diagrams.

Apply

1. Draw the spectrum of AM signal.
2. Find the total power radiated in AM transmitter if carrier power is of 50W and depth of modulation is 0.75.
3. In an FM system, when the audio frequency (AF) is 500Hz and the AF voltage is 2.4V, the deviation is 4.8 KHz. If the AF voltage is now increased to 7.2V, what is the new deviation? If the AF Voltage is raised to 10V while the AF is dropped to 200Hz, What is the deviation? Find the modulation index in each case?
4. What are optimum and matched filters? Find there transfer functions? Is it true that in matched filter error probability depends on signal energy and not on wave shape? Explain.
5. Why matched filter is called so? Derive the relationship between impulse response of the filter and the input signal and give explanation for matched filter.
6. Why matched filter is called so? Derive the relationship between impulse response of the filter and the input signal and give explanation for matched filter.
7. Why matched filter is called so? Derive the relationship between impulse response of the filter and the input signal and give explanation for matched filter.
8. Discuss the maximum length sequence for PN generation and also list and prove the properties of the PN sequence.
9. Derive the expression for bandwidth in Quaternary Phase Shift Keying technique and explain with neat block diagrams.
10. With example explain the types of frequency hopping spread spectrum technique.

Analyse

1. What are the disadvantages of conventional (or) Double side band full carrier system?
2. Derive the expression for AM signal, power considerations for different side bands, efficiency and explain the process of modulation with necessary plots.
3. With block diagram explain M-ary PSK Receiver. Compare M-ARY Modulation schemes?
4. Which type of modulation is known as hybrid? Explain the constellation diagram and its properties.
5. Compare the direct sequence spread spectrum and frequency hopping spread spectrum techniques based on its performance.
6. Explain the generation of slow frequency, HOP spread M-ary FSK and fast frequency HOP spread M-ary FSK with appropriate diagrams.
7. Compare the performance of TDMA, FDMA and CDMA with its applications.

8. A spread spectrum communication system has the following parameters: Information bit duration (Tb) is 4.095 ms, PN chip duration (Tc) is 1 μs and the ratio Eb/N0 is of 10. Find the Jamming Margin in dB.

Evaluate

1. For an AM DSBFC transmitter with an un-modulated carrier power Pc=100W that is simultaneously modulated by 3 modulating signals with co-efficient of modulation m1=0.2, m2=0.4 and m3=0.5. Determine total co-efficient of modulation, upper and lower sideband power, total sideband power, total transmitted power and then draw the output spectrum.
2. Illustrate the basic idea of correlative coding by considering the specific example of duo binary signaling.

Create

1. Modulate mobile data using Direct Sequence Spread Spectrum with Binary PSK Modulation.
2. Instead of having towers everywhere for cell phones, why do they not have Satellites run all cell phone signals? If it is implemented, what are the parameters to be used?

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT405 COMPUTER NETWORKS 3 0 0 3

Course Objectives

- Introduce the basic concepts of computer networking and expose the core data communication protocols
- Understand the functions of each layer and familiarize with contemporary issues in networking technologies

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Compare OSI model with TCP/IP protocol suite and design a network based on four different topologies.
2. Design and analyze error and flow control algorithms for communication between adjacent nodes in a network.
3. Identify and apply the suitable routing algorithms for the given network.
4. Develop a client/server application using TCP/UDP and design algorithms for end-end communication.
5. Analyze the capabilities of application layer utilities and replicate the same for new applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2	3		1								-	
2	1	3	3	2										
3	1	3	2	1									-	
4	1	3	2										-	
5		2	3	1		1							-	

UNIT I **9 Hours**

DATA COMMUNICATIONS

Introduction: Data Communications, Networks, Network Types, Protocol Layering, TCP/IP Protocol Suite, OSI Model - Physical Layer: Introduction to Physical Layer, Digital Transmission, Analog Transmission, Multiplexing and Spectrum Spreading - Transmission Media: Guided Media, Unguided Media.

UNIT II **9 Hours**

DATA LINK LAYER

Introduction to Data Link Layer - Link Layer Addressing - Error Detection and Error Correction : Introduction, Block Coding, Cyclic Codes, Checksum, Forward Error Correction - Data Link Control: DLC services, Data-Link Layer Protocols, HDLC, Point-to-Point Protocol - Media Access Control: Random Access - Ethernet: IEEE 802.3 - IEEE 802.11.

UNIT III **9 Hours**

NETWORK LAYER

Network Layer Services - Packet Switching - IPV4 Addresses - Forwarding of IP Packets - Network Layer Protocols: IP, ICMPv4, Mobile IP - Routing algorithms- Unicast Routing Protocols - Next Generation IP: IPv6 Addressing, IPv6 Protocol.

UNIT IV **9 Hours**

TRANSPORT LAYER

Introduction to Transport Layer: Transport Layer Services, Connectionless and Connection-Oriented Protocols, Simple Protocol, Stop-and-Wait Protocol, Go-Back-N Protocol, Selective-Repeat Protocol, Bidirectional Protocols: Piggybacking - User Datagram Protocol - Transmission Control Protocol - Congestion Control - SCTP.

UNIT V **9 Hours**

APPLICATION LAYER

Client Server Programming - World Wide Web and HTTP - FTP - Electronic Mail - Telnet - Secure Shell - Domain Name System - Internet Security: Network Layer Security, Transport Layer Security, Application Layer Security, Firewalls.

FOR FURTHER READING

Simple Network Management Protocol (SNMP).

Total: 45 Hours

Reference(s)

1. Behrouz A Forouzan, Data Communication and Networking, Fifth Edition, Tata McGraw-Hill, 2013.
2. Andrew S Tanenbaum and David J Wetherall, Computer Networks, Fifth Edition, Pearson Education, 2010.
3. William Stallings, Data and Computer Communications, Tenth Edition, Prentice Hall, 2013.
4. Larry L Peterson and Bruce S Davie, Computer Networks:A Systems Approach, Fifth Edition, Elsevier, 2011.
5. James F Kurose and Keith W Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Sixth Edition, Addison-Wesley, 2012.
6. James F Kurose and Keith W Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Sixth Edition, Addison-Wesley, 2012

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	6			4	6																			18
2					2	4				4				4								6			20
3					2	4				4				4								6			20
4	2	4			2	4							2	2								6			22
5	2	2			2	6				4				4											20
Total																									100

Assessment Questions

Remember

1. List the layers of OSI Model.
2. Mention the different types of transmission media.
3. List out the protocols used for noiseless channels.
4. What is Hamming distance?
5. Mention the functions of Network layer.
6. What is NAT?
7. What attributes can be used to describe a flow of data?
8. Give some well known port numbers of UDP.
9. List out the three transmission modes of FTP .
10. In electronic mail, what are the tasks of a user agent?

Understand

1. What is the significance of the twisting in twisted-pair cable?
2. Name the data units at different layers of the TCP / IP protocol suite.
3. What is the need of bit-stuffing?
4. How does a single-bit error differ from a burst error?
5. What is a default mask in IPv4 addressing?
6. Differentiate direct and indirect delivery.
7. Differentiate between open-loop congestion control and closed-loop Congestion control.
8. How back pressure method helps control congestion?
9. Differentiate between a session and a connection in SSL.
10. What is the importance of transfer encoding in MIME?

Apply

1. Which transmission mode (Simplex, half-duplex, or full-duplex) can be compared to the following?
   a. A heated argument between Husband and Wife.
   b. A computer-to-monitor connection.
   c. A polite conversation between HOD and Student.
   d. A television broadcast.
2. Compute the CRC generator and checker for a given a 10 bit data sequence “1010011110” and the divisor “1011”
3. The timer of a system using the Stop-and-Wait ARQ Protocol has a time-out of 6 ms. Draw the flow diagram for five frames if the round trip delay is 4 ms. Assume no data frame or control frame is lost or damaged.
4. Calculate the subnet mask for IP address 42.14.20.59/10.
5. Find the Network addresses, Broadcast address, Number of effective addresses/Subnet, Subnet ID and Host ID for the following IP Addresses Notation.
   (a)10.192.22.22/12
   (b)172.16.2.56/20
6. The following is the content of a UDP header in hex format .
   CB84000D001C001C
   a. What is the source port number?

b. What is the destination port number?
c. What is the total length of user datagram?
d. What is the length of the data?
e. Is the packet directed from a client to server or vice versa?
f. What is the client process?

7. Suppose a TCP connection is transferring a file of 5000 bytes. The first byte is numbered 10,001.What are the sequence numbers for each segment if data are sent in five segments, each carrying 1000 bytes?
8. A sender sends a series of packets to the same destination using 6-bit sequence numbers. If the sequence number starts with 0,
   a. How many packets can be sent without repetition of sequence number?
   b. From which packet onwards the same sequence number will be repeated after two cycles.
   c. What is the sequence number after sending 545 packets?
   d. what is the maximum size of the send and receive windows for Go Back N ARQ and Selective Repeat ARQ protocols
9. Design the CAMPUS LAN configuration of our institution and validate with a neat diagram. (Note: Consider # of departments, # of Systems/Department, future expansion of the institution, # of servers required for an institution, allocation of IP addresses, etc.)
10. The following is a dump of a TCP header in hexadecimal format.
    05320017 00000001 00000000 500207FF 00000000
    a. What is the source port number?
    b. What is the destination port number?
    c. What the sequence number?
    d. What is the acknowledgment number?
    e. What is the length of the header?
    f. What is the type of the segment?
    g. What is the window size?

Analyse

1. Analyze the following four networks and discuss the consequences if a connection fails.
   a. Five devices arranged in a mesh topology
   b.Five devices arranged in a star topology (not counting the hub)
   c.Five devices arranged in a bus topology
   d.Five devices arranged in a ring topology
2. Compare and analyze OSI reference model with TCP/IP Protocol Suite.
3. How many errors can be detected using simple parity check and two dimensional Parity-check?Explain.
4. With a neat diagram, explain the network configuration of our institution in terms of topology, transmission media and connecting devices.
5. What are the differences between classful addressing and classless addressing in IPv4?
6. Differentiate Subnetting and Supernetting.
7. A block of addresses is granted to a small organization. We know that one of the addresses is 205.16.37.39/28. What are the first address, last address and no. of addresses in the block?
8. Analyze Process to Process delivery with Host to host and Node to node delivery. Compare the outcomes of analysis.
9. Suppose Alice with a Web-based e-mail account (such as Yahoo! mail or Hotmail) sends a message to Bob, who accesses his mail from his mail server using POP3. Discuss how the message gets from Alice's host to Bob's host. Be sure to list the series of application-layer protocols that are used to move the message between the two hosts.

Evaluate

1. Find the range of addresses in the following blocks.
   a. 123.56.77.32/29
   b. 200.17.21.128/27
   c. 17.34.16.0/23
   d. 180.34.64.64/30

Create

1. Design the flow control diagram for the following problem:
   Suppose a computer sends a frame to another computer on a bus topology LAN.The physical destination address of the frame is corrupted during the transmission. What happens to the frame? How can the sender be informed about the situation? Justify your answer mentioning the selection of right protocol, if any.
2. An ISP is granted a block of addresses starting with 190.100.0.0/16 (65,536 addresses). The ISP needs to distribute these addresses to three groups of customers as follows:
   a. The first group has 64 customers; each needs 256 addresses.
   b. The second group has 128 customers; each needs 128 addresses.
   c. The third group has 128 customers; each needs 64 addresses.
   Design the sub blocks and find out how many addresses are still available after these allocations.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT406 MICROPROCESSORS AND MICROCONTROLLERS

3 0 2 4

Course Objectives

- Study about the advanced architecture of microprocessors
- Learn the assembly language program of microprocessors
- Interface microprocessor with other devices
- Provide knowledge on fundamentals, design complexity, power, reliability and performance of micro-controller at all levels.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Compare and analyze the architectural features and instruction set of 8085,8086 microprocessors
2. Develop an ALP for machine level program processing using 8086 instruction set.
3. Classify and analyze the advance microprocessor by its features, capabilities and processing speed.
4. Analyze the communication interface techniques used between the peripheral devices and microprocessor.
5. Determine the operational features of 8051 microcontroller and develop the ALP using 8051 instruction set.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3												
2	1	1	3		2								-	
3	1	2												
4	1	3			1									
5	2	1	2		1								-	

UNIT I **7 Hours**

INTRODUCTION OF MICROPROCESSOR

Evolution of microprocessor and types -8085 microprocessor architecture-8086 microprocessor architecture, instruction set and assembler directives.

UNIT II **10 Hours**

PROGRAM STRUCTURES IN 8086

Simple sequence program - Jumps, Flags and conditional flags - If-then else program - While do programs - Repeat - until programs - Instruction delay and timing loops - Strings - Procedures .

UNIT III **8 Hours**

ADVANCED MICROPROCESSOR

Intel 80386 - 80486 architecture - ARM Processor Design Philosophy - Pipeline - Instruction set.

UNIT IV **10 Hours**

COMMUNICATION INTERFACES

Interfacing I/O ports - PIO 8255, Modes of Operation of 8255 - Interfacing ADC - Interfacing DAC - Programmable Communication Interface 8251 USART.

UNIT V **10 Hours**

INTRODUCTION TO MICROCONTROLLERS

Architecture of 8051 - Signal Description of 8051 - Register set of 8051 - Operational Features of 8051 - Memory and I/O Addressing by 8051 - Interrupts of 8051 - Instruction Set of 8051 - Microcontroller Applications.

FOR FURTHER READING

Case study on Pentium and AMD group of processors.

1 **3 Hours**

EXPERIMENT 1

Write an assembly language program to perform 16 bit arithmetic operations for 8086. (using Various Addressing Modes).

2 **3 Hours**

EXPERIMENT 2

Write an assembly language program to perform Binary to BCD code conversions.

3 **3 Hours**

EXPERIMENT 3

Write an assembly language program to perform Rolling Display.

4 **3 Hours**

EXPERIMENT 4

Write an assembly language program to perform USART Operation in 8051.

5 **3 Hours**

EXPERIMENT 5

Write an assembly language program to perform Interfacing Matrix/Keyboard to 8051.

6 **3 Hours**

EXPERIMENT 6

Write an assembly language program to perform Data Transfer from Peripheral to Memory through DMA controller 8237/8257.

7 **4 Hours**

EXPERIMENT 7

Write an assembly language program to perform Digital to analog conversion.

8 **4 Hours**

EXPERIMENT 8

Write an assembly language program to perform Analog to digital conversion.

9 **4 Hours**

EXPERIMENT 9

Write an assembly language Program to design digital clock using 8086.

Total: 75 Hours

Reference(s)

1. Douglas V Hall,Microprocessor and Interfacing, 2nd Edition, TMH, 2nd Edition, 2006.
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D Mckinlay, 8051 microcontroller and embedded systems, Pearson Education, 2nd Edition, 2009.
3. A K Ray and K M Bhurchandi, Advanced Microprocessor and Peripherals, Tata McGraw Hill, 2nd Edition, 2013.
4. Andrew N Sloss, ARM System Developer Guide Designing and Optimizing, 2nd Edition, Elsevier publication, 2004.
5. Yuchenhiu, Glenn A Gibson, Microprocessor Systems - 8086/ 8088 Family, Prentice Hall of India, 2nd Edition, 2003.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2		3			2				3	2		4												16
2	3	2				2	4		4	5				4	3			2							29
3		2				3	4		4	2	3			5	3			3							29
4			4		2					7					3										16
5					4						6														10
Total																									100

Assessment Questions

Remember

1. List the internal parts of microprocessor.
2. Define T-state?
3. Define the terms:
   a. Memory address
   b. Machine code
4. List the features of 8051.
5. Label the data memory organization of 8051.
6. List out two modes of operations present in 8086.
7. List out two modes of operations present in 8086.
8. Define brust transfer.
9. Identify the priority schemes used in 8257 DMA.
10. Define cascade mode.
11. State the RAM organization of 8051.
12. Recall clock signals are generated in 8085 microprocessor.
13. Define Interrupt.

Understand

1. Why semiconductor is used in design of electronic devices.
2. Identify three different cycles of DMA operation.
3. Identify three microcontrollers with power saving mode.
4. ARM processors where basically designed for _____ .
   a) Main frame systems
   b) Distributed systems
   c) Mobile systems
   d) Super computers
5. Illustrate the internal architecture of 8251A (USART) with its two operating modes.
6. Explain in detail about various operations performed by the microprocessor.
7. Differentiate between opcode and operand.
8. Explain the functions of the following signals of 8086?
   a)ALE
   b) DEN
   c) LOCK
   d) TEST
   e) MN/MX
   f) BHE
   g) READY
   h) NMI
   i) HOLD
   j) INTR
9. Illustrate the format of IE register of 8051 microcontroller and discuss its functions.
10. Explain how baud rate is calculated for serial data transfer in mode 1?

Apply

1. Why the data bus bi-directional?
2. Write an general algorithm for ADC interfacing.
3. Assume register B holds 93H and A holds 15H. Illustrate the results of instructions ORA B, XRA B, and CMA.
4. Load the accumulator A with the data byte 52H and save the data in register B.
5. Execute a program to
   a. Clear A
   b. Add 47H(use ADI)
   c. Subtract 92H
   d. Add 64H
   e. Display results for c. and d. options

   Specify the answers you would expect at the output ports.
   Specify the reason for clearing A before adding the number 47H directly to A.
6. Write an assembly language program for 8085 MPU to do the following operations:
   a. 8-bit addition
   b. 8-bit subtraction
   c. 8-bit multiplication
   d. 8-bit by 8-bit division
7. Write a program to illustrate data transfer operations and arithmetic operations.
8. Execute a program to illustrate logic operations and branch operations.
9. Show the interfacing schematic of FDC 8272 with 8086 in non-DMA mode. Will this circuit be practically useful? Justify.
10. Represent various Instructions available in 8051 microcontroller and with example.

Analyse

1. Differentiate between register and memory.
2. Write instructions to load the hexadecimal numbers 65H in register C, and 92h in the accumulator A .Display the number 65H at PORT0 and 92H at PORT1?
3. Write a program to exchange the contents of memory locations 2000H and 4000H.
4. How DMA transfer the data faster?
5. Why to assemble all components in a PCB is not a affordable solution?
6. When building code for both ARM and Thumb states, which tool decides for each function call
   whether to use a BL or BLX instruction?
   A) The linker
   B) The archiver
   C) The compiler
   D) The assembler
7. How the keyboard is scanned and refreshed periodically?

Evaluate

1. Write a program to find the l's complement of the number stored at memory location 4400H and store the complemented number at memory location 4300H.
2. Write a program to shift an eight bit data four bits right. Assume data is in register C.
3. Write a program to add the 16-bit number in memory locations 4000H and 4001H to the 16-bit number in memory locations 4002H and 4003H. The most significant eight bits of the two numbers to be added are in memory locations 4001H and 4003H. Store the result in memory locations 4004H and 4005H with the most significant byte in memory location 4005H.
4. (i) Write a program to convert HEX to ASCII.
   (ii) Program to implement BCD TO BINARY conversion.

Create

1. Construct a PIC microcontroller based washing machine.
2. Investigate the memory Performance and Scalability of pentium and AMD Processors .

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15IT407 DATABASE MANAGEMENT SYSTEMS LABORATORY **0 0 2 1**

Course Objectives

- Understand queries and maintain a simple database using Structured Query Language (SQL)
- Learn different applications and constructs of PL/SQL
- Present the concepts and techniques relating to ODBC and its implementations

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. Design a database with different types of integrity constraint using MySQL.
2. Implement stored procedures, stored functions and cursors using MySQL.
3. Implement database connectivity using JDBC and ODBC driver.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2			3				1					
2	1	1			2				1		2			
3	1	1	2	2	2			1	2					
4		2	3											
5	1	2			3									

1 **3 Hours**

EXPERIMENT 1

Data Definition Language.

3 Hours

2

EXPERIMENT 2
Data Manipulation Language.

3 **3 Hours**

EXPERIMENT 3
DQL Command to perform Nested and Join Queries.

4 **3 Hours**

EXPERIMENT 4
Views Creation and Manipulation.

5 **3 Hours**

EXPERIMENT 5
Functions and Procedures.

6 **3 Hours**

EXPERIMENT 6
Cursors and Triggers.

7 **3 Hours**

EXPERIMENT 7
Database connectivity techniques.

8 **6 Hours**

EXPERIMENT 8
Design and implementation of a Database Application.

9 **3 Hours**

EXPERIMENT 9
Report Generation in DBMS.

10 **0 Hours**

EXPERIMENT 10
Mini Project in DBMS.

Total: 30 Hours

Reference(s)

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2014.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems , Seventh Edition, Pearson / Addison - Wesley, 2015.
3. Raghu Ramakrishnan, Database Management Systems, Third Edition, McGraw Hill, 2012.

Evaluation Pattern

Preparation / Pre 10	5
Experiment & Results / E&R 10	10
Record / Observation / RO 10	5
Test -Cycle I / TCI 50	15
Test-Cycle II / TCII 50	15

15IT408 COMPUTER NETWORKS LABORATORY 0 0 2 1

Course Objectives

- Give emphasis to the hands-on experience of networking issues in a real time environment
- Explore how abstract concepts are designed to work in real life and to observe how they really behave
- Understand the basics and working of the various networking protocols

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Construct and configure a network using network devices.
2. Implement capturing and analyzing of packet with NS2 simulator.
3. Develop and implement an algorithm for flow control and error control.
4. Develop a program for protocols in transport and application layer.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2		1	1		3		1				1	
2			3		2		3		2				2	
3		1	3		2				2					
4		1	3		3				1					

1 **3 Hours**

EXPERIMENT 1

Structured cabeling, Patch panel and I/O module installation

2 **3 Hours**

EXPERIMENT 2

Hardware and Software Firewall - Configuration of Policies,Scheduling, Web filtering, Application filtering, Assigning of IP address and Bandwidth Monitoring

3 **3 Hours**

EXPERIMENT 3

Virtual LAN - Access Port and Trunk Port Configuration

4 **3 Hours**

EXPERIMENT 4

Experiment on packet capturing and analyzing tools

5 **3 Hours**

EXPERIMENT 5

Implementation of Flow Control algorithms

6 **3 Hours**

EXPERIMENT 6

Implemtation of Data Link Framing Methods and CRC Polynomials

7 **3 Hours**

EXPERIMENT 7

Implementation of IP addressing classification and Routing algorithms

8 **3 Hours**

EXPERIMENT 8

Transport Layer: Datagram(UDP) socket programming

9 **3 Hours**

EXPERIMENT 9

Transport Layer: Stream (TCP) socket Programming

10 **3 Hours**

EXPERIMENT 10

Application Layer: SMTP and HTTP programming

Total: 30 Hours

Evaluation Pattern

Preparation / Pre 10	5
Experiment & Results / E&R 10	10
Record / Observation / RO 10	5
Test -Cycle I / TCI 50	15
Test-Cycle II / TCII 50	15

15IT409 MINI PROJECT II **0 0 2 1**

Course Objectives

- Understand the need for a good database design
- Provide knowledge on fundamentals, design complexity, power, reliability and performance of microprocessor and micro-controller at all levels
- Design, analyze and formulate various network topology using the network components

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
4. Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
5. Prepare report and present oral demonstrations

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		3	2			2	1							
2	2	2	1	3		2					2	2		
3			3	2	2			2			2	2		
4		1		2	3	1	2	2						
5									3	3		2		

Total: 0 Hours

Evaluation Pattern

Review I / RI 25	25
Review II / R 25	25
Report / Report 50	25
Presentation&Viva Voce / PVV 50	25

15GE410 LIFE SKILLS: VERBAL ABILITY 0 0 2 0

Course Objectives

- Read and understand business passages
- Employ various types of sentences in Business Correspondence
- Equip students with strategies for vocabulary development

Programme Outcomes (POs)
Course Outcomes (COs)

1. Read and understand business related articles
2. Identify errors in the given sentences
3. Attempt vocabulary related questions in competitive exams
4. Write coherent business letters, e-mails, reports and proposals
5. Write instructions and descriptions related to business contexts

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	2													
3	1	2												
4		1												
5	2	1												

1 **15 Hours**

UNIT 1

Synonyms - Antonyms - Word groups - Verbal analogies - Etymology - Critical Reasoning - Cloze Test - One Word Substitutes - Idioms and Phrases - Text and Paragraph Completion

2 **15 Hours**

UNIT 2

Sentence formation - Paragraph formation- Change of voice - Change of Speech - Reading Comprehension - Sentence Equivalence - Jumbled Sentences - Spotting Errors - Homophones - Homonyms - Commonly Mispronounced/Misspelt Words

Total: 30 Hours

Reference(s)

1. Raymond Murphy. English Grammer in use - A self study reference and Practice book for intermediate learners of English IVed. United Kingdom: Cambridge University Press. 2012.
2. Lewis, Norman. Word Power Made Easy. Goyal Saab Publisher, 2011.
3. Baron's the Official Guide for New GMAT Review 2015. New Jersey : John Wiley & Sons, Inc.

Evaluation Pattern

Periodical Test II / PT2 50 Periodical Test I / PT1 50	50
Final Examination (LS) / FLS 100	50

15IT501 WEB TECHNOLOGY 3 0 0 3

Course Objectives

- Study about designing web pages with the help of frames and scripting languages
- Develop web sites which are secure and dynamic in nature using Javascript
- Learn the importance of server-side scripts like JSP and servlets for web Interactivity and Web Hosting

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Analyse and determine an appropriate web server configuration based on stated user needs
2. Design web-applications using open source technologies such as HTML, DHTML CSS and PHP.
3. Implement static, dynamic and interactive web pages and web applications using Javascript, Jquery and Ajax.
4. Apply dynamic page functionality in web pages using Servlets.
5. Develop JSP applications with Model View Control architecture.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	1											
2	1	2	3		3									
3	1	2	3		3									
4	2	2	3		3									
5	2	2	3		3									

UNIT I **8 Hours**

INTRODUCTION TO WEB

Web Concepts - Web Technology Protocols - Web Servers - Internet Web Server - Personal Web Server - Apache Web Server - JBOSS - XAMP - Emerging Technologies in web.

UNIT II **9 Hours**

SCRIPTING BASICS

HTML Basics - Forms - Tables - Links - DHTML - XHTML - CSS - Internal Style sheets - External Style sheets- PHP Basics - Dynamic Content - Form processing - XML - DTD - XSD.

UNIT III **10 Hours**

SCRIPTING LANGUAGES

JavaScript - Variables - Statements - Popup Boxes - Functions - Loops - Error Handling - Date and String objects - Ajax Basics, Accessing database - Jquery.

UNIT IV **9 Hours**

SERVLETS

Introduction- Servlet features - Servlet Overview Architecture - Three Tier Applications - Servlet package and API - Configuring Servlet - Handling HTTP Request - Get and post request - Redirecting request- Session Tracking and Cookies.

UNIT V **9 Hours**

JAVA SERVER PAGES

Introduction - JSP architecture - Life cycle - JSP Tags and Implicit objects - JSTL - Core Tags - SQL Tags - Formatting Tags - JDBC - Accessing database

FOR FURTHER READING

Web Hosting - Web Configuration - Web Development Tools - Web database controls - JSF - Tags - Event Handling - AJAX Integration

Total: 45 Hours

Reference(s)

1. Kogent Learning Solutions, Web Technologies: Black Book, Dreamtech press, 2014.
2. Harvey M Deitel and Paul J Deitel, Internet and World Wide Web - How to Program, Fifth Edition, Pearson Education, 2012.
3. John Pollock, JavaScript- A Beginners Guide,Fourth Edition, Tata McGraw-Hill, 2010.
4. Jeffrey C Jackson, Web Technologies: A Computer Science Perspective,Second Edition, Pearson, 2009.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2					2				8							2				2				16
2		2					4				2			2				2				6			18
3									2				4				8				8				22
4									6	2			8	2			8								26
5										4								8			6				18
Total																									100

Assessment Questions

Remember

1. List the elements of XSL.
2. Mention the default constraints of primary key.
3. State the page directives in JSP.
4. Name the methods of Response objects in ASP.
5. Explain about the installation, Configuration and Functioning ofÂ following web servers.
   i) JBOSS
   ii) Apache Web Server Â
6. Describe about the ways of including style information in a HTML document using CSS and compare each of the style sheet types with Class and ID attributes.
7. Define SSI.

8. Describe the working principle of E-Mail system with all the protocols and show how to manage the E-mail during a hosting transfer.
9. Explain features and importance of AJAX .
10. How to read Cookies using the Request Object?

Understand

1. Compare and contrast HTML & XML
2. How do you create a new object in JavaScript?
3. How to create virtual directory in IIS?
4. Categorize DTD, XML Schema with XML.
5. How can I retrieve values from one database server and store them in other database server using PHP?
6. Summarizethe protocols needed for client server communication and show how to manage the E-mail during a hosting transfer with the working principle of E-Mail.
7. Give the use of onload and onclick event in web design.
8. Which statement is used to bind an image and table in webpage?
9. How can I enable session tracking for JSP pages if the browser has disabled cookies? Illustrate with an example.
10. Difference between DHTML & XHTML.

Apply

1. Describe about the working principle of ASP with proper diagram, also briefly explain about the Filesystem Objects and Session objects in detail.
2. Prepare a suitable XML document on “Employee management system”. Also check whether the xml document is validated against XML schema or not.
3. Discover a suitable constraints on XML DTD and XML schema for the givenÂ XML document.
   sample.xml
   Everyday Italian
   Giada De Laurentiis
   2005
   30.00
   Â
4. Write a Javascript for the HTML form that has a 4 number of Textboxes. When the form runs in the browser fill the Textboxes with data. Write JS code that verifies that all Textboxes have been filled. If a Textbox has been left empty, popup an Alert indicating which Textbox has left empty .When the Alert’s OK button is clicked on, set focus to that specific Textbox. If All the Textboxes are filled, display a Thank.
5. Design a HTML page with two links to an external document. The first link should lead to the beginning of the external document. The second link should lead to a particular section in the external document.
6. Construct the correct way to create a function in PHP for radio button & check box processing in a form.
7. Write a program in java script to switch between XHTML list formats using switch case statement.
8. Write a program in JavaScript to embed audio/video file with embed element.
9. Write a program in JavaScript to handle the redirection of HTTP requests.
10. Use a one dimensional array and write a script to solve the problem.Read in 20 numbers each of which is between 10 and 100.As each number is read,print it only if not duplicate of a number that is already read

Analyse

1. Show the ASP code snippet for database connectivity using ADO for the following operations
   (i)insert the data into the database
   (ii)fetch the data from the database
2. Write a JSP code that takes the user’s name and age from a form.Echo back the name and age along with a message stating the price of movie tickets.The price is determined by the age

passed to the JSP.If the age is greater than 62, the movie ticket price is Rs 7.00.If the user is less than 10 years old, the price is Rs 5.00.

3. Construct a Servlet program to display the session details of the client request and display theSession ID, Last access time, creation time and No of times visited details in HTML.
4. Write an asp code for the following operations and trace each operation with suitable inputs.
   1. Set a date/time when a page cached in a browser will expire.
   2. How to use information from forms.
5. Analyze the different data models of the real world databases and explain the relational dataÂ model with an instance of student's relation.

Evaluate

1. Construct a Servlet that lets a user vote for his favorite food from a combo box or radio buttons (the user must be able to make muliple food selections per request).Store the favorite foods and the number of votes for each food.Display all foods and their number of votes in alphabetical order back to the user.Use an appropriate Collection class or Map class to store the data.
2. Convert the given information into a XML file and then convert this XML File data into HTML file as it is. Also validate the XML Document with DTD Schema.

Roll	name	subject code	marks
122IT101	Raj	101	78
122EC102	Kumar	501	84
111CS103	vengatesh	202	85

3. Â
4. Prompt a user for the cost price and selling price of an article and output the profit and loss percentage.
5. Create an HTML page named DeleteAllCookies.asp. Write code that will delete all the cookies your Web site has created on the client' computer.
6. Create a button in your page. On clicking that button, it will display the following: a) Name of the window. b) Color of the page. c) Last modified date. d) Location of your HTML file. e) Name of the button that is clicked.

Create

1. Create a web page of customer profile for data entry of customer's in a Hotel, The profile should include Name, Address, Age, gender, Room Type (A/C, Non- A/C or Deluxe), Type of payment (Cash, Credit/Debit Card or Coupons).
2. Create a HTML form that has a number of Textboxes. When the form runs in the browser fill the Textboxes with data. Write JS code that verifies that all Textboxes have been filled. If a Textbox has been left empty, popup an Alert indicating which Textbox has left empty .When the Alert's OK button is clicked on, set focus to that specific Textbox. If All the Textboxes are filled, display a Thank.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT502 SYSTEM PROGRAMMING AND OPERATING SYSTEMS

3 0 2 4

Course Objectives

- Understand the role of system software in improving the system performance
- learn the importance of Operating System and its functionalities
- Obtain insight into the design of an operating system

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. 1. Identify the machine dependent and independent loader features which allocate memory location for executing the object program.
2. 2. Compare the features of one pass, two pass and multipass assembler in terms of performance and analyze the suitable assembler for the given program.
3. 3. Evaluate the CPU scheduling algorithms based on throughput, Response time and waiting time for the real world problems.
4. 4. Implement the memory management scheme for given specific operating system problem
5. 5. Design I/O management scheme for the real world problems.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	1	2		2										
3	2	2	3								2			
4			2								2			
5			3								2			

UNIT I **9 Hours**

ASSEMBLER AND COMPILER

SIC,SIC/XE - Assembler Machine dependent and Machine independent Assembler features - One pass assembler,Two pass assembler - Multipass assembler Compilers Introduction - Structure of a compiler - phases of a compiler.

UNIT II **9 Hours**

LINKER AND LOADER

Basic Loader functions- Machine Dependent Loader Features - Machine Independent Loader Features - Loader Design Options - Linkage Editors - Dynamic Linking. Bootstrap Loaders.

UNIT III **9 Hours**

PROCESS MANAGEMENT

OS Definition - Process Definition - Process Control Interacting Processes - Scheduling Policies - Job Scheduling - Process Scheduling Deadlocks - Definitions - Resource Status Modeling - Handling Deadlocks - Deadlock Detection and Resolution - Deadlock Avoidance - Process Synchronization Critical Sections - Classical Process Synchronization Problems - Semaphores.

UNIT IV **9 Hours**

MEMORY MANAGEMENT

Directory Structures - File Protection - Allocation of Disk Space - Implementing File Access - File Sharing - Memory Allocation - Contiguous Memory Allocation - Noncontiguous Memory Allocation - Virtual Memory Using Paging - Virtual Memory Using Segmentation.

UNIT V **9 Hours**

IO MANAGEMENT AND FILE ORGANIZATION

I/O Devices - Organization of the I/O Function - Operating System Design Issues - I/O Buffering - Disk Scheduling - Disk Cache - File Organization - File Directories - Secondary Storage Management.

FOR FURTHER READING

Embedded Operating Systems: Characteristics of Embedded Systems, Embedded Linux, and Application specific OS

Introduction to Service Oriented Operating System (SOOS).

1 **3 Hours**

EXPERIMENT 1

Unix commands and shell programming

2 **3 Hours**

EXPERIMENT 2

Simulation of Pass 1 and pass 2 of the two pass assembler

3 **3 Hours**

EXPERIMENT 3

Simulation of a single pass assembler

4 **3 Hours**

EXPERIMENT 4

Simulation of Linker and Loader

5 **3 Hours**

EXPERIMENT 5

Interprocess Communication using pipes

6 **3 Hours**

EXPERIMENT 6

Simulation of CPU Scheduling algorithms

7 **3 Hours**

EXPERIMENT 7

Implementation of page replacement Algorithms

8 **3 Hours**

EXPERIMENT 8

File Manager implementation - open. close, read, write, seek, delete

9 **3 Hours**

EXPERIMENT 9

Simulation of memory management Schemes

10 **3 Hours**

EXPERIMENT 10

Unix commands and shell programming

Total: 75 Hours

Reference(s)

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, 9th Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2012.
2. Leland L Beck and D Manjula, System Software - An Introduction to Systems Programming, Pearson Education 2011.
3. Andrew S. Tanenbaum, Modern Operating System, Prentice Hall of India Pvt. Ltd, 2015.
4. William Stallings, Moumita Mitra Manna, Operating Systems: Internals and Design Principles, Pearson Education Limited, 2014.
5. Hans-Erik Eriksson, Magnus Penker, Brain Lyons and David Fado, UML Toolkit, OMG Press Wiley Publishing Inc., 2010

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2				4						4								10				5		25
2			2			4				4									10				5		25
3	2						4				4				5										15
4	2						4				4							10							20
5			2				4				4			5											15
Total																									100

Assessment Questions

Remember

1. Name the registers present in SIC and SIC/XE.
2. What are the assembler directives?
3. Name the fields present in defines and text record.
4. List the use of a relocation bit.
5. What is a compiler?
6. What is an operating system?

7. List the different categories of system calls.
8. Define response time
9. How can the system recover from deadlock?
10. What is process control block?

Understand

1. How indirect, immediate and simple addressing mode is indicated using bits n, i, x, b,p and e?
2. How are LABELS entered in SYMTAB and when are they referred?
3. can you explain how program relocation is indicated and handled by assemblers?
4. Why fixed partition is not suitable for multi programming?
5. Summarize the design of an editor.
6. How would you classify the phases of compiler?
7. Since protecting hardware unit from user is crucial in Operating system design, How Should the operating system designer must protect I/O devices, memory and CPU from user?
8. Consider one file is in optical device and you need to copy that file into pen drive. Illustrate the concepts of System Calls using above scenario and group them into process, file system and Information maintenance system calls.
9. What steps must the Linux developers take to ensure that the system is portable to different processors andÂ memory-management architectures, and to minimize the amount of architecture-specific kernel code?Â
10. What is the main difficulty that a programmer must overcome in writing an operating system for real-time environment?
11. Consider a variation of round-robin we will call progressive round-robin. In progressive round- robin, each process has its own time quantum. This starts out at 50 ms, and increases by 50 ms each time it goes through the round-robin queue. Give the advantages and disadvantages of this variant over ordinary round-robin.

Apply

1. Â How would you use the SIC instruction to swap values of two numbers?
2. Identify the difference between the following sequences of statements.
   Â a. LDA #3
   Â b. THREE EQU 3. . LDA #THREE
   Â c. THREE EQU 3. . LDA THREE
3. In SIC / XE, what is the difference between simple addressing and immediate addressing?
4. What is the pupose of Test Device instruction?
5. Consider the following set of processes, with the length of CPU-burst time given in milliseconds:
   Process Â Burst TimeÂ Â priority
   P1 10 3
   P21 1
   P3 2 3
   P4 1 4
   P55 2
   The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0. Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a non pre-emptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.
6. Consider that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is
   86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 Starting from the current head position, what is the total distance that the disk arm moves toÂ satisfy all the pending requests, for each of the disk scheduling algorithms?
7. Which algorithm makes the most efficient use of memory? Given memory partitions of 100K, 500K, 200K, and 600K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes ofÂ 212K, 417K, 112K, and 426K (in order)?

8. Assume that a system consists of four resources of same type, they are shared by three processes, each of which needs almost two resources.Show that the system is deadlock free.
9. What are the three requirements that a solution to the critical-section problem satisfy?
10. What is the need for condition variables in monitors and how are they different from conventional variables?

Analyse

1. How would you analyze the source program errors that could be detected during lexical analysis?
2. How programmers decide whether to use a macro or a sub routine to accomplish a given logical function?
3. Suppose we want macro definitions to appear as a part of the assembly listing, how could the macro processor and the assembler accomplish this?
4. How could a recursive macro processor be implemented in assembler language?
5. A barbershop consists of a waiting room with n chairs and the barber room containing the barber chair. If there are no customers to be served, the barber goes to sleep. If a customer enters the barbershop and all chairs are occupied, then the customer leaves the shop. If the barber is busy but chairs are available, then the customer sits in one of the free chairs. If the barber is asleep, the customer wakes up the barber. Apply process synchronization technique to coordinate the barber and the customers.
6. Consider the following page reference string:
   1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.
   How many page faults would occur for the following replacement algorithms, assuming one, two, three, four, five, six, or seven frames? Remember all frames are initially empty, so your first unique pages will all cost one fault each.
   • LRU replacement
   • FIFO replacement
   • Optimal replacement
7. What does an assembler perform when it encounters LTORG assembler directive?
8. What is the purpose of relocation bit in object code of relocation loader?
9. Compare Linking loader and linkage editor
10. Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames.
    a. How many bits are there in the logical address?
    b. How many bits are there in the physical address?

Create

1. Write a program to indicate the CPU utilization time of current running process using various scheduling algorithms.
2. Write a program that implements the FIFO and LRU page-replacement algorithms. First generate a random page reference string where page numbers range from 0 to 9. Apply the random page-reference string to each algorithm and record the number of page faults in each algorithm.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15IT503 COMPUTATIONAL THEORY AND COMPILERS **3 2 0 4**

Course Objectives

- Acquire knowledge of Automata Theory as the basis of all computer science languages design
- Learn the tools used for Lexical and Syntax analysis
- Enrich the knowledge in various phases of compiler ant its use

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Construct finite automata for given pattern and find its equivalent regular expressions.
2. Design and simplify context free grammar and find equivalent pushdown automata for given language.
3. Generate the machine code considering the functionalities involved in different phases of the compilation process.
4. Implement the parsing techniques including Bottom-up and Top-down parsing for the given programming construct described in Context Free Grammar.
5. Design code generators for the specified machine and apply the various optimization techniques to speedup the compilation time.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	2										1	1
2	3	2	3										2	2
3	3	2	3										2	2
4	2	2	2										2	2
5	1	2	3										2	2

UNIT I **10 Hours**

FINITE AUTOMATA

Introduction - Basic Mathematical Notation and techniques - Finite State systems - Basic Definitions - Finite Automaton - DFA & NDFA - Regular Languages- Regular Expression - Equivalence of NFA and DFA - Equivalence of NDFAs with and without input moves - Equivalence of finite Automaton and regular expressions - Minimization of DFA.

UNIT II **9 Hours**

GRAMMARS AND PUSHDOWN AUTOMATA

Grammar Introduction - Types of Grammar - Context Free Grammars and Languages - Derivations and Languages - Ambiguity - Relationship between derivation and derivation trees - Simplification of CFG - Elimination of Useless symbols - Unit productions - Null productions - Pushdown Automata - Definitions - Moves - Instantaneous descriptions - Deterministic pushdown automata - Equivalence of Pushdown automata.

UNIT III **8 Hours**

LEXICAL ANALYSIS

Introduction to Compiling - The grouping of phases - Compiler construction tools. The role of the lexical analyzer - Input buffering - Specification of tokens - Recognition of tokens - A language for specifying lexical analyzer.

UNIT IV **8 Hours**

SYNTAX ANALYSIS

Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top-down parsing - Bottom-up Parsing - SR parsers - LR parsers - Constructing an SLR(1) parsing table. Type checking - Type Systems - Specification of a simple type checker.

UNIT V **10 Hours**

CODE GENERATION AND OPTIMIZATION

Intermediate languages - Declarations - Assignment statements - Boolean expressions - Case statements - Backpatching - Procedure calls - Issues in the design of a code generator - The target machine - Run-time storage - management - Basic blocks and flow graphs - Next-use information - A simple code - generator - Register allocation and assignment - The dag representation of basic blocks - Generating code from DAGs.

FOR FURTHER READING

The recursion theorem - Decidability of logical theories - Turing reducibility.

Total: 75 Hours

Reference(s)

1. Hopcroft J E, Motwani R and Ullman J D, Introduction to Automata Theory, Languages and Computations, Second Edition, Pearson Education, 2012.
2. Alfred V Aho, Ravi Sethi Jeffrey D Ullman, Compilers- Principles, Techniques, and Tools, Third Edition, Pearson Education Asia, 2009.
3. Steven S Muchnick, Advanced Compiler Design and Implementation, Second Edition, Morgan Kaufmann Pulishers, 2008.
4. Raghavan V, Principles of Compiler Design, Third Edition, Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 2009.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4				3	6							3												16
2	3					4				4													8		19
3	2	2			4										6				6				8		28
4	2	2				6				2	6							6							24
5	2	2			2	4													3						13
Total																									100

Assessment Questions

Remember

1. State the pumping lemma for regular languages.
2. Define Pushdown Automata.
3. Define Diagonalization Language.
4. List any four additional forms of proof.
5. Define turing machine with its notation.
6. Define handle pruning.
7. List any four function preserving transformations on basic blocks.
8. Define DAG.
9. State the syntax directed translation for if-else statement.
10. List the three types of error recovery procedures used in syntax analyzer.

Understand

1. Explain the syntax directed translation for assignment statements.
2. Explain the 8 phases of compiler.
3. Exemplify the role of lexical analyzer
4. Explain the role of parser in compilation.
5. Summarise the principal sources of optimization.
6. Represent in DFA for accepting strings of a‘s and b‘s with atmost two consecutive a‘s.
7. Summarize the closure properties of regular languages
8. Summarize the relation between PDA and CFG with suitable theorem
9. Explain the programming techniques of Turing machines
10. Explain inductive proof with suitable diagram

Apply

1. Construct a DFA for the regular expression a*
2. Construct a syntax tree for the regular expression (a/b)*a
3. Show the construction of basic blocks for the quick sort program segment.
4. Show the optimization on basic blocks with an example.
5. Show the program translation process for a program segment.
6. Show the significance of PDA.
7. Illustrate the language acceptance of a DFA with an example.
8. Implement the following by the principle of Induction For all n ≥ 0 :Â ∑Â i2 = (n(n+1)(2n+1))/6
9. Construct epsilon NFA for the regular expression (a/b)(a/b)(a/b)
10. Demonstrate the encoding technique of Universal TM with an example.

Analyse

1. DAG representation is more suitable than syntax tree for the intermediate code representation. Justify
2. Compare the top-down and bottom-up parsers.
3. Compare compiler and interpreter
4. Differentiate NFA and DFA.
5. Differentiate PDA and TM

Evaluate

1. Determine whether the following grammar is ambiguous or not E→E+E|E-E|id
2. Determine the source language issues involved in the code generation phase of a compiler
3. Check the ambiguity in the arithmetic grammar.
4. Check that the given CFG is ambiguous
   S→0B|1A
   A→0|0S|1AA
   B→1|1S|0BBÂ
5. Is the language L={aibjck|i<j<k} a CFL? Justify

Create

1. Generate a three address code, basic blocks and flow graph for the programming segment of Quick sort.
2. Generate a derivation tree for the string aabbaa with the given production S→aAS|a, A→SbA|SS|bA

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT504 DIGITAL SIGNAL PROCESSING 3 0 0 3

Course Objectives

- study the classification and analyse discrete time signals and systems
- Design systems for the given specification
- learn the finite word length effects in real time processing

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Understand and analyze different types of signals and systems
2. Analyze the Discrete-time signals using Fourier and Z-Transform
3. Design a digital IIR filter from analog filter using suitable transformation techniques
4. Design a digital FIR filter using different windowing techniques and implement it for different applications
5. Analyze the finite word length effects in real time processing and use the concepts in signal processing applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	-	1		-									
2	1	2	-	-	2									
3	1		3	-	2									
4	1		2	-	3									
5	2		2	-	3									

UNIT I **8 Hours**

SIGNALS AND SYSTEMS

Continuous and discrete time signals - Classification of Discrete time signals: Periodic and Aperiodic - Even and Odd - Energy and Power signals - Deterministic and Random signals - Complex exponential and Sinusoidal signals - Periodicity - Analysis of Linear time invariant systems using Convolution.

UNIT II **8 Hours**

ANALYSIS OF DISCRETE TIME SIGNALS

Discrete Fourier Transform (DFT), FFT: Radix - 2 DIT and DIF algorithms, Analysis of DT signals using Z- Transform -Properties of Z-transform - Inverse z-transform using Power Series expansion, Relationship between Z-transform and Fourier transform.

UNIT III **10 Hours**

IIR FILTER DESIGN

Butterworth and Chebyshev approximations - Design of Discrete time IIR filter from continuous time filter - IIR filter design by Impulse Invariance method, Bilinear transformation method - Structure of IIR System.

UNIT IV **10 Hours**

FIR FILTER DESIGN

Linear phase filter - Symmetric and Anti-symmetric FIR filters - Windowing technique: Rectangular, Hamming, Hanning windows - Frequency sampling techniques - Structure for FIR systems: Direct form, Linear phase realization structure.

UNIT V **9 Hours**

FINITE WORD LENGTH EFFECTS

Quantization noise - Over flow error - Truncation error - Limit cycle oscillation - Signal scaling - Interpolation and Decimation: Decimation by an integer factor - Interpolation by an integer factor - Sampling rate conversion by a rational factor.

FOR FURTHER READING

Case study on digital signal processors.

Total: 45 Hours

Reference(s)

1. John G Proakis and Dimtris G Manolakis, Digital Signal Processing Principles, Algorithms and Application, Fifth Edition, PHI/Pearson Education, 2013.
2. Michael J Roberts, Govind Sharma, Fundamentals of Signals and Systems, Second Edition, McGraw-Hill, 2010.
3. Alan V Oppenheim, Alan S Willsky and S Hamid Nawab, Signals and Systems, Second Edition, PHI/Pearson Education, 2010.
4. Vinay K Ingle, John G Proakis, Digital Signal Processing with Matlab, Third edition, Cengage Learning, 2011.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1		3			2						5		4				3				2				19
2			4			5				2			2					6							19
3		3				2					5			4					4			3			21
4			3					3		4					5			2							17
5	3				3			4		4				5					5						24
Total																									100

Assessment Questions

Remember

1. List the properties of convolution.
2. Differentiate energy and power signal

3. Define Z-transform and ROC
4. State initial value theorem and final value theorem
5. Mention the effect of Gibb's phenomenon.
6. What are the design techniques available for the designing FIR filter?
7. Give the necessary and sufficient condition for the linear phase characteristic of FIR filter?
8. Define Multirate signal processing
9. Write the characteristics features of rectangular window
10. Which of the following is used to alter FIR filter coefficients so they smoothly approach zero at both ends?
11. Draw the block diagram of DSP

Understand

1. How many multiplications and additions are involved in radix-2 point FFT?
2. Elucidate the three stage of butterfly structure for DIT FFT algorithm.
3. What is the drawback of rectangular window in FIR filter design?
4. What is the equation to find Quantization error ?
5. Derive the three stage of butterfly structure for DIT FFT algorithm.
6. Define warping effect and how it can be eliminated
7. Determine the values of energy and power of the signal x(n)=(1/2)nu(n)
8. Explain the characteristics of a limit cycle oscillation with respect to the system described by the equation
   y(n) = a y(n-1) + x(n). Determine the dead band of the filter.
9. Draw the 2 point butterfly diagram of DIT-FFT algorithm and DIF- FFT algorithm
10. How analog frequency is mapped to digital frequency in bilinear transformation?
11. What are the basic building blocks to realize any structure?

Apply

1. Using frequency sampling method, design a band pass filter with the following specifications :
   Sampling frequency F=8000Hz,
   cut off frequency Fc1=1000Hz
   and Fc2=3000Hz.
   Determine the filter coefficients for N=7.
2. Derive the fourier series method of designing FIR filter and the effect of Gibb's phenomenon
3. Obtain Z transform of x(n)={1,2,3,4}.
4. Find DFT of the sequence x(n)={ 2,1,2,1,2,1,2,1} using DIT FFT algorithm.
5. Perform the linear convolution for the given sequence and verify the result using tabulation method x(n) ={3,-6,2,1,7,2} and h(n)={1,2,1,2}
6. Derive and explain the sampling rate conversion process by the factor I and I/D with its spectrum.
7. With neat diagram and supportive derivation explain multirate signal processing using decimation techniques
8. Apply impulse invariant method to design a digital filter for T=0.2 sec, where the analog filter transfer function is given as
   H(S)= 10 / (S2+3S+2)
9. What is the total energy of the discrete time signal x(n) which takes the value of unity at n= -1,0,1.
10. Check whether the unit step signal is an energy signal or not

Analyse

1. What will be the output of a system if the input is x(n) and impulse response of the system is h(n)?
2. If x(n) is a sequence of L number of samples and h(n) with M samples, after convolution y(n) will have how many samples
3. What is zero padding?
4. Why rectangular window are not used in FIR filter design using window method?
5. Determine the circular convolution of the following two sequences. x1(n)={2,3,4,1} and x2(n) = {4,2,1,2}

6. If x(n)=0.92465 and quantized by 3 bits using truncation method, What is the quantization error?
7. How will you determine the error range for truncation and round-off process?
8. Derive the expression for steady state input noise power and steady state output noise power due to quantization error.
9. Rounding or truncation introduces an error whose magnitude depends on ----------

Evaluate

1. Test whether the following signals are periodic or not and if the signal is periodic,Calculate its fundamental period.
   x(n) = cos(6pi*n)
   x(n) = sin(100pi*t) cos(150pi*t)

Create

1. How do I test my FIR implementation?
2. How to implement a FIR resampler using coefficient constant

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT507 WEB TECHNOLOGY LABORATORY 0 0 2 1

Course Objectives

- Understand various Scripts like HTML, XML and JavaScript
- Study the various rich internet applications using Ajax
- Learn the server side programming using JSP and Servlets

Programme Outcomes (POs)

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Build interactive web applications using HTML, DHTML and CSS
2. Design dynamic web pages using AJAX, PHP and XML
3. Implement the web authoring tools with the database design for web development

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1					3									
2			2	3										
3					3						2	2		

1 **3 Hours**

EXPERIMENT 1

Create a webpage using HTML Elements and Frames

2 **3 Hours**

EXPERIMENT 2

Use Cascading Style sheets for designing the DHTML web page

3 **3 Hours**

EXPERIMENT 3

Design a dynamic web page with validation using JavaScript

4 **3 Hours**

EXPERIMENT 4

Create the DTD and XML Schema to validate XML File

5 **3 Hours**

EXPERIMENT 5

Design a web page using PHP with MySQL as backend

6 **3 Hours**

EXPERIMENT 6

Create a AJAX program to Receive data and Process XML Objects in the DOM

7 **3 Hours**

EXPERIMENT 7

Demonstrate a web application with Servlets

8 **3 Hours**

EXPERIMENT 8

Write the JSTL Formatting tags todesigna and validate web forms

9 **3 Hours**

EXPERIMENT 9

Implement a JSP script to access information from a Database using JDBC

10 **3 Hours**

EXPERIMENT 10

Design a web catalogue with JSF

Total: 30 Hours

Evaluation Pattern

Preparation / Pre 10	5
Experiment & Results / E&R 10	10
Record / Observation / RO 10	5
Test -Cycle I / TCI 50	15
Test-Cycle II / TCII 50	15

15IT508 DIGITAL SIGNAL PROCESSING LABORATORY

0 0 2 1

Course Objectives

- Understand the processes of analog-to-digital and digital-to-analog conversion
- Understand the concept of Multi-rate signal processing and sample rate conversion
- Learn the basic forms of FIR and IIR filters, and how to design filters with desired frequency responses.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Understand and analyze different types of signals and systems
2. Apply Sampling theorem and Compute the output response of the system, sampling rate conversion and FFT spectrum.
3. Design digital FIR filters using different windowing techniques
4. Design digital IIR filters from analog filter using suitable transformation techniques
5. Analyze the finite word length effects for speech signal in real time processing and use the concepts in signal processing applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2			2									
2		2				1								
3			2			3								
4			1		2									
5			1		3									

1 **3 Hours**

EXPERIMENT 1

Generate standard Discrete time signals which are used in real time systems.

2 **3 Hours**

EXPERIMENT 2

Sample the continuous time signal by different sampling rate, verify the sampling theorem. With the results find the effect of aliasing.

3 **5 Hours**

EXPERIMENT 3

In an LTI system the input signal is of x (n) and the impulse response of the system is of h (n). Find the output of the system using the concept of Convolution. (LTI systems like Amplifier, filters, modulators can be considered as the given system)

4 **3 Hours**

EXPERIMENT 4

Convert the given time domain signal into frequency domain signal with minimum number of operations.

5 **6 Hours**

EXPERIMENT 5

Using Rectangular, Hamming and Hanning windows design FIR filter for different band specifications.

6 **6 Hours**

EXPERIMENT 6

Design an analog Butterworth and Chebyshev filters and convert them into digital IIR filters

7 **2 Hours**

EXPERIMENT 7

Perform interpolation and decimation process for a sinusoidal signal

8 **2 Hours**

EXPERIMENT 8

Record the speech signal in a noisy and clean environment and obtain the enhanced speech signal using speech enhancement techniques

Total: 30 Hours

Evaluation Pattern

Preparation / Pre 10	5
Experiment & Results / E&R 10	10
Record / Observation / RO 10	5
Test -Cycle I / TCI 50	15
Test-Cycle II / TCII 50	15

15IT509 TECHNICAL SEMINAR I 0 0 2 1

Course Objectives

- Get acquainted with the real working environment of IT.
- Understand the impact of engineering solutions on the society and also will be aware of contemporary issues.

Programme Outcomes (POs)

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Refer and utilize various technical resources available from multiple fields
2. Improve the technical presentation and communication skills
3. Analyze the importance of intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds
4. Interact and share their technical knowledge to enhance the leadership skills
5. Prepare report and present oral demonstrations.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2				2								
2					1			3	3	2		2		
3										3		1		
4		2				2		1	2	2		1		
5								2	2	2		2		

Total: 0 Hours

Evaluation Pattern

Presentation I / PrI 25	25
Presentation II / PrII 25	25

15IT510 MINI PROJECT III 0 0 2 1

Course Objectives

- Learn the server side programming using JSP and Servlets
- Understand the processes of analog-to-digital and digital-to-analog conversion

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Formulate a real world problem, identify the requirement and develop the design solutions
2. Identify technical ideas, strategies and methodologies
3. Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project
4. Test and validate through conformance of the developed prototype and analysis the cost effectiveness
5. Prepare report and present oral demonstrations

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		3	2			2	1							
2	3	2	1	3		2					2	2		
3			3	2	2			2			2	2		
4		1		2	3	1	2	2						
5									3	3		2		

Total: 0 Hours

Evaluation Pattern

Review I / RI 25	25
Review II / R 25	25
Report / Report 50	25
Presentation&Viva Voce / PVV 50	25

15GE511 LIFE SKILLS: APTITUDE I 0 0 2 0

Course Objectives

- To expose the undergraduate students to such methods and practices that help, develop and nurture qualities such as character, effective communication, aptitude and holding ethical values.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Distinguish the pattern of coding and decoding.
2. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions
3. Evaluate critically the real life situations by resorting and analyzing analytical reasoning of key issues and factors
4. Calculate the percentages and averages

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		2												
3		1												
4		1												

1 **3 Hours**

CODING AND DECODING

Introduction - Description of Coding method - Coding patterns - Concepts of Coding and Decoding - Problems involving Coding and Decoding methods

2 **3 Hours**

SEQUENCE AND SERIES

Introduction - Sequences of real numbers - Number and Alphabet series - Description of Number and Alphabet series - Analogy - Odd man out- Power series

3 **3 Hours**

DATA SUFFICIENCY

Introduction to Data Sufficiency - Overview of the wide variety of Data Sufficiency problems - Basic introduction on how to determine what information is sufficient to solve a given problem - Common pitfalls to avoid

4 **3 Hours**

DIRECTION

Introduction to Direction - sense test - Overview of the wide variety of Direction problems -Direction - Plotting diagrams

5 **3 Hours**

PROBLEM ON AGES

Introduction- basic concept - usage of percentage and averages- applications

6 **3 Hours**

ANALYTICAL REASONING

Introduction - basic concept - non verbal analytical reasoning - arrangements

7 **3 Hours**

BLOOD RELATION

Introduction - Basic concept - Kinds of relation - Tree diagram - Relations

8 **3 Hours**

BLOOD RELATION

Introduction -Basic concept - Kinds of relation - Tree diagram - Relations

9 **3 Hours**

VISUAL REASONING

Introduction - Basic concepts - Odd man out - Next series - Mirror image and water image

10 **3 Hours**

SIMPLIFICATIONS

Introduction - Basic concepts - Arithmetic operations -Equation solving methods - Puzzles

Total: 30 Hours

Reference(s)

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012.
3. Dr.R S Aggarwal, Quantitative Aptitude, Seventh Revised Edition, S.Chand Publishing Company Ltd, 2013.
4. Edgar Thorpe , Course In Mental Ability And Quantitative Aptitude For Competitive Examinations, Third Edition, Tata McGraw-Hill Publishing Company Ltd, 2013.
5. Arun Sharma, How to prepare for Quantitative Aptitude for the CAT, Fifth Edition, Tata McGraw-Hill Publishing Company Ltd, 2013

Evaluation Pattern

Periodical Test II / PT2 50 Periodical Test I / PT1 50	50
Final Examination (LS) / FLS 100	50

15GE701 ENGINEERING ECONOMICS 3 0 0 3

Course Objectives

- To introduce the concepts of micro, macro economic systems and business decisions in organizations.
- To acquire knowledge on laws of demand & supply and methods of forecasting the demand
- To emphasis the systematic evaluation of the costs, breakeven point for return on economics and diseconomies
- To acquaint in pricing methods, payback and competition in modern market structure
- To obtain knowledge on macro economics, various taxes and financial accounting procedures

Programme Outcomes (POs)
Course Outcomes (COs)

1. Explain the micro economic environment for creating a favourable business environment.
2. Make use of the major concepts and techniques of engineering economic analysis in real time applications.
3. Compare the cost of multiple projects by using the methods learned, and make a quantitative decision between alternate facilities and/or systems.
4. Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.
5. Examine and evaluate the issues in macro-economic analysis.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		3	2											
3			1											
4		1	2											
5		2												

UNIT I **9 Hours**

INTRODUCTION

Introduction to Micro and Macro economics - Kinds of Economic Systems - Production Possibility Frontier - Opportunity Cost - Objective of Organizations - Kinds of Organization.

UNIT II **9 Hours**

DEMAND AND SUPPLY

Functions of Demand and Supply - Law of diminishing Marginal Utility - Law of Demand and Supply - Elasticity of Demand - Demand Forecasting Methods - Indifference curve.

UNIT III **9 Hours**

PRODUCTION AND COST

Production Function - Returns to Scale - Law of Variable Proportion - Cost and Revenue concepts and Cost Curves - Revenue curves - Economies and Dis-economies of scale - Break Even point.

UNIT IV **9 Hours**

MARKET STRUCTURE

Market Structure - Perfect Competition - Monopoly - Monopolistic - Oligopoly - Components of Pricing - Methods of Pricing - Capital Budgeting IRR - ARR - NPV - Return on Investment - Payback Period.

UNIT V **9 Hours**

INTRODUCTION TO MACRO ECONOMICS AND FINANCIAL ACCOUNTING

National Income - Calculation Methods - Problems - Inflation - Deflation - Business Cycle - Taxes - Direct and Indirect Taxes - Fiscal and monetary policies.

FOR FURTHER READING

Nature and characteristics of Indian Economy - Role and functions of Central bank - LPG - GATT - WTO.

Total: 45 Hours

Reference(s)

1. A Ramachandra Aryasri and V V Ramana Murthy, Engineering Economics and Financial Accounting, Tata McGraw Hill Publishing Company Limited, New Delhi, 2006.
2. V L Samuel Paul and G S Gupta,Managerial Economics Concepts and Cases, Tata McGraw Hill Publishing Company Limited, New Delhi, 1981.
3. R Kesavan, C Elanchezhian and T Sunder Selwyn, Engineering Economics and Financial Accounting, Laxmi Publication (P) Ltd, New Delhi, 2005.
4. S N Maheswari, Financial and Management Accounting, Sultan Chand
5. V L Samuel Paul and G S Gupta, Managerial Economics-Concepts and Cases

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2					2					8			6											18
2		2					2			8					6				4						22
3			2			2				8								4							16
4	2						2		8						6				4						22
5		2				2				8				6				4							22
Total																									100

Assessment Questions

Remember

1. Define Economics
2. What is opportunity cost?
3. List the types of Demand.
4. State the law of Demand.
5. Define Elasticity of Demand.
6. State the different degrees of elasticity of Demand?
7. List the factors determining Elasticity of Demand?
8. State the Law Of Diminishing Marginal Utility.
9. Define Replacement Cost and Historic Cost
10. Define Monopoly.
11. Define Oligopoly
12. Name the two types of Oligopoly.
13. List the objectives of Pricing?

14. Define Accounting
15. Define inflation

Understand

1. Explain the nature and scope of Economics.
2. List and explain the focus areas of Managerial economics.
3. Give reasons why mangers aim to maximize sales even at the cost of a lower profit.
4. Explain the nature of Demand.
5. What are the assumptions made when talking about the Law of Diminishing Marginal Utility?
6. Explain the characteristics of the Indifference Curve with examples
7. Can Demand Forecasting principles be applied to Services? Substantiate your answer with an example
8. What are the characteristic features of an oligopoly industry?
9. What causes Oligopoly?
10. Explain the types and features of Cost Based Pricing.
11. Explain the types and features of Demand Based Pricing.
12. Under what conditions does a company go in for Cross Subsidization pricing?
13. What is the role of the Central bank in controlling inflation?

Apply

1. Explain decisions based on the degree of certainty of the outcome with examples.
2. Give examples of products falling under the various kinds of competition, and the reasons they are able to survive in the market.
3. Give six examples of products that fall under Monopolistic Competitive pricing.
4. Give six examples of products that fall under Oligopolistic pricing
5. Pick any six Consumer Items and based on your knowledge of the markets, explain the pricing method that you think is most likely to have been followed for each of these items.

Analyse

1. Differentiate between Macro and Micro economics
2. Differentiate between Extension and Increase in Demand.
3. Distinguish between Cost and Price
4. Compare the merits and demerits of the Deductive Method and the Inductive Method of Investigation
5. The per-capita income of farmers in the country has to be raised by 20% this year to prevent their migration to cities. Discuss this statement from the point of view of Positive and Normative Economics.
6. Decision making improves with age and experience- Discuss.
7. Do a survey of the automotive (only cars) industry and analyze the reasons and timing for discounts offered from the point of view of elasticity of demand
8. How would you modify a sealed bid pricing system to take care of different technical approaches by different bidders for a project for which bids are called for, given that the cost varies depending on the technical approach?

Create

1. Create a matrix consolidating the definitions of the word ï¿½??Economics as defined by the leading Economists in the prescribed textbook. Using this define economics the way you understand it, in less than 50 words.

2. Study the price of a commodity over a period of one year and explain the possible reasons for the fluctuations from an economist‘s point of view
3. You are in a job which is paying you adequately. You are called for an interview for a job that double your salary. Unfortunately you miss the only train that will take you in time for the interview. How will you justify the cost of taking a flight considering the cost concepts you have learnt.?
4. Due to cancellation of an export order, you are stuck with a huge stock of jeans of international quality. Device a pricing strategy for disposing this stock without incurring a loss, considering that it is a very competitive market.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT602 DATA MINING AND ANALYTICS 3 0 0 3

Course Objectives

- Gather and analyze large sets of data to gain useful business understanding
- Understand the data mining functionalities, technologies and steps in preprocessing the data
- Learn data mining algorithms, methods and tools

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Course Outcomes (COs)

1. Design data warehouse by applying principles of dimensional modelling and ETL concepts
2. Analyze various data pre-processing techniques for efficient data mining.
3. Apply statistical procedure, machine learning and neural network based classification algorithms for data prediction.
4. Apply association rule mining and clustering algorithms for the application and generalizations for real time problems.
5. Apply text mining on the web contents and analyse the application and trends for web mining.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	3		2									
2	1	2	3			2								
3	2	2	3											
4	2	2	3											
5						2								

UNIT I **8 Hours**

DATA WAREHOUSING

Need for data warehouse - Building blocks - Principles of dimensional modeling:Star schema,Snowflake schema and Galaxy schema - Data extraction - Transformation and Loading - OLAP models.

UNIT II **9 Hours**

DATA MINING

Data Mining Functionalities - Technologies in Data Mining - Major Issues - Data objects and attribute types - Statistical Description of data - Measuring data similarity and dis-similarity - Data Cleaning - Data Integration and Transformation - Data Reduction - Discretization - Concept Hierarchy Generation.

UNIT III **9 Hours**

CLASSIFICATION

Decision Tree Induction - Naive Bayes classification - Rule based classification - Classification by Back propagation - Support Vector machine.

UNIT IV **10 Hours**

ASSOCIATION RULE MINING AND CLUSTERING

Market Basket Analysis: Frequent item set - Frequent item set mining methods - Clustering:Partitioning methods - Hierarchical methods - Outlier detection methods.

UNIT V **9 Hours**

ADVANCED TOPICS

Text mining - Mining the world wide web - Applications and trends in data mining - Spatial Data Mining - Multimedia Mining.

FOR FURTHER READING

Case Study on bigdata analytics.

Total: 45 Hours

Reference(s)

1. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Second Edition, Elsevier, 2012.
2. Paulraj Ponniah, Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, Wiley, 2010.
3. Alex Berson, Stephen J Smith, Data warehousing, Data mining, and OLAP, Tata McGraw Hill edition, 2004.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2				2	4					4		3												15
2		2			2	2				4	4			4	2										20
3	2				4	4	4						2	4											20
4	2	2			2	4	4			4	4			4	4										30
5	2				2	4	4							3											15
Total																									100

Assessment Questions

Remember

1. Define Data warehouse.
2. Define Pre Pruning.
3. What is Data Mart?
4. List out the OLAP operations.
5. State the goals of Data Mining.
6. State the limitations of Data Warehouse.

7. Define Frequent item set.
8. What are the steps followed in Back Propagation?
9. Write the three tiers in Data warehouse Architecture.
10. What is Content-Based retrieval?

Understand

1. Write the transformation tools used in Data Warehouse?
2. How a database design is represented in OLAP systems?
3. How concept hierarchy is generated?
4. How the different layers of warehouse architecture differ from each other?
5. What are the requirements for cluster analysis?
6. How the decision tree induction classifies data?
7. What are the factors involved while choosing data mining system?
8. How data mining is used in banking industry?
9. How the efficiency of apriori is improved?
10. What is the purpose of anti-monotone property in apriori algorithm?

Apply

1. Illustrate the smoothing techniques in cleaning the data and apply on the data set.
   2,25,2,1,1,5,4,25,36
2. Identify the frequent item set using apriori algorithm for,
   M,O,N,K,E,Y
   D,O,N,K,E,Y
   M,U,C,K,Y
   D,U,C,K,Y
   K,E,Y
3. Identify the attributes for hotel management system and perform the OLAP operations for the same.
4. Explain the design and construction of data warehouse.
5. How does support differ from confidence in market basket analysis?
6. Show the rollup and drilldown for the following:
   i) City
   ii) Consumer products
7. How does the k-means algorithm classify the data?
8. Show with an example how the input, output and hidden layer works with back propagation.
9. Given frequent set {A, B, E}, what are possible association rules?
   A=>B, E
   A, B=>E
   A, E=>B
   B=>A, E
   B, E=>A
   E=>A, B
   __=>A, B, E (empty rule), or true=>A, B, E
10. How the frequent item sets are generated with the candidate keys?

Analyse

1. Describe the method of generating frequent item sets without candidate generation.
2. Differentiate between OLTP and OLAP operations.
3. Compare data mining and data warehouse.
4. How to generate association rules from frequent item sets?
5. Distinguish between multidimensional and multi-relational OLAP.
6. How the Support Vector machine is used in classification?
7. Compare MOLAP and HOLAP.

Evaluate

1. How data mining system can be integrated with a data warehouse? Discuss with an example.
2. Decision tree induction is a popular classification method. Taking one typical decision tree induction algorithm, briefly outline the method of decision tree classification.
3. Justify how computations can be performed efficiently on data cubes.

Create

1. Discuss the current trends in data mining.
2. How the preprocessing step is done in hospital management system?

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT603 INFORMATION CODING TECHNIQUES 3 2 0 4

Course Objectives

- Apply the concept of probability to model information and compress text
- Use the principles of differential coding to compress speech
- Exploit the three types of redundancies to design image compression algorithms
- Identify the temporal redundancy component along with coding, spatial and inter-pixel redundancy to design video compression algorithms
- Design algorithms to ensure error free communication / information retrieval

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Apply the concept of probability to model information and compress text
2. Apply the principles of differential coding to compress speech
3. understand the need for channel coding and design efficient channel coders
4. Identify the temporal redundancy component along with coding, spatial and inter-pixel redundancy to design video compression algorithms
5. Design algorithms to ensure error free communication / information retrieval

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	2											
2	1	3	2											
3		2	3											
4	1	2	3									-		
5		3										-		

UNIT I **9 Hours**

INFORMATION ENTROPY FUNDAMENTALS

Uncertainty - Information and Entropy - Source coding Theorem - Shannon Fano coding - Huffman coding: static and dynamic - Discrete Memory less channels - Channel coding Theorem - Channel capacity - Channel capacity Theorem.

UNIT II **9 Hours**

DATA AND VOICE CODING

Differential Pulse code Modulation - Adaptive Differential Pulse Code Modulation - Delta Modulation - Adaptive Delta Modulation - Adaptive subband coding - Coding of speech signal at low bit rates - Linear Predictive Coding.

UNIT III **9 Hours**

IMAGE CODING

Image Compression - Types: spatial, transform based - Bit plane coding - DCT, Walsh, and Hadamard Transforms for compression - Graphics Interchange format - Tagged Image File Format - Digitized Pictures - JPEG standards.

UNIT IV **9 Hours**

MULTIMEDIA CODING

Perceptual coding - MPEG audio coders - Dolby audio coders - Video compression - Principles - H.261 and MPEG Video.

UNIT V **9 Hours**

ERROR CONTROL CODING

Linear Block codes - Syndrome Decoding- Minimum distance consideration - Cyclic codes - Generator Polynomial - Parity check polynomial - Encoder for cyclic codes - Calculation of syndrome - Convolutional Coding - Decoding using Viterbi Algorithm.

FOR FURTHER READING

Case study on Wavelet compression.

Total: 75 Hours

Reference(s)

1. Simon Haykin, Communication Systems, John Wiley and Sons, 4th Edition, 2014.
2. Fred Halsall, Multimedia Communications, Applications Networks Protocols and Standards, Pearson Education, 2012.
3. Mark Nelson, Data Compression Book, BPB Publication, 2010.
4. Rafael C.Gonzalez and Richard E.Woods, Digital image processing, PHI, 2013.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1		3			2						5		4				3				2				19
2			4			5				2			2					6							19
3		3				2	3				5			4					4			3			24
4			3				4			4					5			2							18
5	3				3					4				5					5						20
Total																									100

Assessment Questions
Remember

1. Define Entropy, Capacity and information.
2. Give the upper bound and lower bound for entropy.
3. Define discrete memory less source.
4. What is the need for compression techniques?

5. Define processing delay and algorithm delay in speech coders.
6. Give the error correcting capability of a linear block code.
7. Define syndrome in error correcting coding.
8. State two properties of syndrome (used in linear block codes).
9. What is the significance of a syndrome vector in the context of error control coding?
10. Categorize the DCT blocks depending on their derivation.

Understand

1. What are the two functional requirements needed in the development of an efficient source encoder?
2. What is Lmin ? How is it determined?
3. What is encoding?
4. What is temporal masking and frequency masking?
5. What is perceptual coding? Give the advantages of perceptual coding.
6. State the advantages of coding speech at low bit rates.
7. What is dolBy AC-1? List the advantages of dolby AC-1.
8. How syndrome is calculated in Hamming codes and cyclic codes?
9. Why syndrome decoder is called maximum likelihood decoder?
10. I-frames are inserted into the compressed output stream relatively frequently. Justify the same by explaining the terms “Group of pictures(GOP)” and “prediction span”.

Apply

1. Calculate entropy H(X) for a discrete memory less source X, which has four symbols X1,X2, X3 & X4 with probabilities P(X1)=0.4,P(x2)=0.3,P(X3)=0.2 and P(x4)=0.1.
2. Consider an additive white Gaussian noise channel with 4 KHz bandwidth and noise power spectral density $\eta/2$=10-2 w/Hz. The signal power required at the receiver is 0.1 mw. Calculate capacity of this channel.
3. Enlighten the principles of LPC. Draw the schematic diagram of an encoder and decoder, and identify and explain the perception parameters and associated vocal tract excitation parameters.
4. Briefly describe the procedures followed in dynamic Huffman coding.
5. A convolution encoder has a single shift register with 2 stages,3 modulo-2 adders and an output multiplexer. The generator sequences of the encoder are as follows g1(x)=(101)and g2(x)=(110) and g3(x)=(111). Draw (i)the block diagram of the encoder, (ii)state diagram and also explain the working principle of the encoder.

6. Find the channel matrix of the resultant channel. Find P(z1) if P(x1)= 0.6 and P(x2)= 0.
7. An analog signal having 4 kHz bandwidth is sampled at 1.25 times the Nyquist rate, and each sample is quantized into one of 256 equally likely levels. Assume that the successive samples are statistically independent.
   (i) What is the information rate of this source?
   (ii) Can the output of this source be transmitted without error over an AWGN channel with a bandwidth of 10 kHz and an S/N ratio of 20 dB?
   (iii) Find the bandwidth required for an AWGN channel for error-free transmission of the output of this source if the S/N ratio is 25 dB.

8. Assume a convolution coder. Draw its tree, state and trellis diagrams. Explain Viterbi algorithm taking a suitable example.
9. Apply Shannon-Fano encoding procedure to the following message symbols x= {x1, x2, x3……x9};
   P= {0.49, 0.14, 0.14, 0.07, 0.07, 0.04, 0.02, 0.02, 0.01}.
   Find the efficiency of coding.

10. Apply Huffman coding algorithm for data compression. For a DMS 'X' with nine symbols x1, x2, x3… x9, Find a compact code for every symbol if the probability distribution is as follows P= {0.49, 0.14, 0.14, 0.07, 0.07, 0.04, 0.02, 0.02, 0.01}
    Calculate: i) Entropy of the source
    ii) Average length of the code
    iii) Code Efficiency and iv) Redundancy of the code v) Code variance

Analyse

1. What is the difference between channel coding and source coding?
2. Differentiate vocoder and waveform coder?
3. How dynamic Huffman coding is different than basic Huffman coding?
4. How CELP provides better quality than LPC in speech coding?
5. Investigate on the 'block preparation 'and quantization phases of JPEG compression process with diagrams wherever necessary.

Evaluate

1. Construct a convolution encoder for the following specification: Rate efficiency=1/2, constraint length=4.The connection from the shift registers to modulo-2 adders are described by the following equations: g1(x)=1+x, g2(x)=x. Determine the output codeword for the input message 1110.
2. A discrete memory less source has an alphabet of five symbols with there are given by, [X] = [X1, X2, X3, X4, X5]
    [P] = [0.45, 0.15,0.15,0.10,0.15]. Compute Two different codes for the above.

3. A) The generator matrix for a (6,3) block code is given below. Find all the code word of this code

    0 0 1 1 1 0
    G= 0 1 0 1 0 1
    0 0 1 0 1 1

    B) Consider a (6,3) linear code whose generator matrix is

    1 0 0 1 0 1
    G= 0 1 0 1 1 0
    0 0 1 0 1 1

    (i) Find all the code vectors.
    (ii) Find all hamming weights and distances.
    (iii)Find minimum weight parity check matrix.
    (iv)Draw the encoder circuit

4. Consider a sequence of letters of English alphabet with their probabilities of occurrence as given here
    Letters = [a, b, c, d, E, f, g, h]
    [P] = [0.1 0.1 0.2 0.1 0.1 0.2 0.1 0.1]
    Compute two different Huffman codes for this source. For these two codes find
    a. Average code word Length
    b. Variance of average code word.
    c. Entropy

5. Draw the macro-block structure of P-frame encoding and explain the encoding procedure.

Create

1. A black and white television picture may be viewed as consisting of approximately 2 x 10^6 elements, each of which may occupy one of 16 distinct brightness levels with equal probability. Assume that the rate of transmission is 30 picture frames per second. All picture elements are assumed to be independent, and all levels have equally likely occurrence. Calculate the average rate of information conveyed by this TV picture source.
2. Consider a telegraph source having two symbols, dot and dash. The dot duration is 0.2 s. The dash duration in 3 times the dot duration. The probability of the dot's occurring is twice that of the dash, and the time between symbols is 0.2 s. Calculate the information rate of the telegraph source.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT604 DESIGN AND ANALYSIS OF ALGORITHMS

3 0 0 3

Course Objectives

- Synthesize efficient algorithms in common engineering design situations
- Familiarize with major algorithms and data structures
- Analyze worst-case running times of algorithms using asymptotic analysis

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Analyze the correctness and efficiency of the basic algorithms
2. 2. Apply the divide and conquer strategy and Greedy Approach to solve applications that involves searching, sorting and selection
3. Apply the Dynamic programming approach for giving solutions to applications with overlapping sub problems.
4. Apply the Back Tracking algorithm to solve the problems using state-space tree
5. Analyze the complexities of polynomial and non-polynomial algorithms

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	2										-	-
2	2	2	3										-	-
3	2	2	3										-	-
4	1	2	2										-	-
5	1	2	2	1									-	-

UNIT I **9 Hours**

ALGORITHM ANALYSIS

Algorithm Analysis - Time Space Tradeoff - Asymptotic Notations - Conditional asymptotic notation - Removing condition from the conditional asymptotic notation - Properties of big - Oh notation - Recurrence equations - Solving recurrence equations - Analysis of linear search.

UNIT II **9 Hours**

DIVIDE AND CONQUER

Divide and Conquer: General Method - Binary Search - Finding Maximum and Minimum - Merge Sort - Greedy Algorithms: General Method - Container Loading - Knapsack Problem.

UNIT III **9 Hours**

DYNAMIC PROGRAMMING

Dynamic Programming: General Method - Multistage Graphs - All-Pair shortest paths - Optimal binary search trees - 0/1 Knapsack - Traveling salesperson problem searching and sorting algorithms.

UNIT IV **9 Hours**

BACKTRACKING

Backtracking: General Method - 8 Queens problem - sum of subsets - graph coloring - Hamiltonian problem - knapsack problem.

UNIT V **9 Hours**

COMPUTATIONAL COMPLEXITY

Computational Complexity: Complexity measures, Polynomial vs non-polynomial time complexity; NP-hard and NP-complete classes, examples. Combinational algorithms, string processing algorithm, Algebraic algorithms, set algorithms.

FOR FURTHER READING

Non deterministic algorithms - Cook's theorem - Strassen's matrix multiplication - probabilistic analysis - Amortized analysis.

Total: 45 Hours

Reference(s)

1. Sara Basse, A V Gelder, Computer Algorithms, Pearson 2012.
2. T H Cormen, Leiserson, Rivest and Stein, Introduction of Computer algorithms, PHI 2011.
3. E Horowitz, S Sahni, and S Rajsekaran, Fundamentals of Computer Algorithms, Galgotia Publication, 2008.
4. Goodman, Introduction to the Design and Analysis of Algorithms, Tata McGraw Hill, 2002.
5. Donald E Knuth, The Art of Computer Programming, Volume I & II, Third Edition, Addision Wessely, 2000.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	4				4	3																		15
2	2				2	5				2				6				2				2			21
3	2				2				4					6	3								6		23
4		2			2					2				6	4				6						22
5		4				3				6									6						19
Total																									100

Assessment Questions

Remember

1. Define sub-set sum problem.
2. What is called divide and conquer strategy?

3. Define greedy method.
4. What is called an optimal binary search tree?
5. Define P class problems.
6. Discuss the approximation algorithms for NP-hard problems.
7. Define dynamic programming.
8. What is memory function?
9. Define the term backtracking.
10. Define feasible solution.

Understand

1. Explain the need of presorting in Element Uniqueness problem.
2. Exemplify the need of presorting in calculating a mode.
3. Describe the algorithms for depth-first search of a graph G= (V, E).
4. Describe the construction sequence of AVL tree with a simple example.
5. Enumerate the general plan of divide and conquer and explain how the quick sort algorithm works for its average case behaviour.
6. Illustrate the Sequential search algorithm with its worst-case behaviour.
7. Exemplify the necessary steps for analyzing efficiency of recursive algorithms with an example.
8. Explain the various steps involved in algorithmic problem solving.
9. Compare LIFO and FIFO search.
10. Classify the three types of time complexity of algorithms.

Apply

1. Construct an AVL tree for the sequence 5,6,8,3,2,4,7.
2. Construct a heap for the list 1,8,6,5,3,7
3. Sort the numbers 1,8,6,5,3,7 using Merge sort.
4. Construct an AVL tree for the sequence 3,6,5,1,2,4.
5. Construct a heap for the list 5,6,8,3,2,4,7
6. Construct a binary search tree for the sequence 10,7,12,13,14.20
7. Design and implement an algorithm for brute force string matching technique.
8. Design a recursive algorithm to compute the factorial function F(n) =n! for an arbitrary non negative integer n and also derive the recurrence relation
9. Design and implement a recursive algorithm to solve the Tower of Hanoi Puzzle. Also find the time efficiency of this algorithm
10. Design a nonrecursive algorithm to determine the value of the largest element in a given array and matrix multiplication. Also find the time efficiency of those algorithms.

Analyse

1. Compare backtracking and branch-and-bound
2. Analyze the time complexity of sorting algorithms based on divide and conquer technique
3. Differentiate deterministic and non deterministic problems
4. Compare DFS and BFS
5. Analyze how Brute force design technique is applied to selection sort with an example
6. Analyze how decrease-by-one technique is applied to insertion sort with an example.
7. Find the time complexity of tower of Hanoi puzzle and give a statistics on all cases

Evaluate

1. Evaluate the algorithm design technique used in Quick sort with an example
2. Evaluate the algorithm design technique used in Merge sort with an example.
3. Determine an optimal solution to the knapsack instance n = 7, m= 15
   (p1, p2, p3, ….p7) = (10, 5, 15, 7, 6, 18, 3) and (w1, w2, w3, ...w7) (2, 3, 5, 7, 1, 4, 1)

Create

1. Derive a non-deterministic algorithm to find whether a given graph contains a Hamiltonian cycle
2. Derive the recurrence relation for Fibonacci series; perform complexity analysis for the same.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT607 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

0 0 2 1

Course Objectives

- Argue the correctness of algorithms using inductive proofs and invariants
- Write correctness proofs for algorithms

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Analyze the performances of the sorting algorithms using divide and conquer techniques.
2. Apply important algorithmic design paradigms and methods of analysis
3. Analyze the complexities of various problems in computational domain
4. Apply backtracking techniques for solving problems related to gaming applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2	2	3				2					
2	1		1	1	2				2				2	
3	1		2	3	1				1				2	
4	2		2	2	2				3				1	

1 **4 Hours**

EXPERIMENT 1

Implement the sorting algorithms and test their correctness and efficiency

2 **4 Hours**

EXPERIMENT 2

Implement Binary Search Trees

3 **4 Hours**

EXPERIMENT 3

Test the efficiency of Minimum Spanning Tree Algorithms

4 **4 Hours**

EXPERIMENT 4

Implement and test Knapsack problem

5 **4 Hours**

EXPERIMENT 5

Implement and analyze the running time of eight-queens problem using backtracking

6 **6 Hours**

EXPERIMENT 6

Implement Travelling Sales Person problem using backtracking and Genetic Algorithm and analyze the implementation complexities

7 **4 Hours**

EXPERIMENT 7

Implementing selection sort using brute-force method

Total: 30 Hours

Evaluation Pattern

Preparation / Pre 10	5
Experiment & Results / E&R 10	10
Record / Observation / RO 10	5
Test -Cycle I / TCI 50	15
Test-Cycle II / TCII 50	15

15IT608 DATA MINING AND ANALYTICS LABORATORY

0 0 2 1

Course Objectives

- Demonstrate the preprocessing statistical methods for any given raw data
- Select and apply data mining algorithms to build analytical application

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. : Design a multidimensional model and perform analytical processing on real world data using visual studio
2. Implement supervised learning techniques using association mining and data Classification algorithms in R
3. Implement unsupervised learning techniques using data clustering algorithms in R
4. Construct web and text mining algorithms to implement advanced mining applications in R

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		1	2	1	2			3	1					2
2	1	1	2	2	1			3	2					1
3	1	2	1	1	2			1	1					2
4	2	1	1	2	1			1	2					2

1 **4 Hours**

EXPERIMENT 1

Design of Data warehouse

2 **4 Hours**

EXPERIMENT 2
On-Line Analytical processing(OLAP)

3 **4 Hours**

EXPERIMENT 3
Implementation of Association Mining Algorithms

4 **4 Hours**

EXPERIMENT 4
Implementation of Data classification Algorithms

5 **4 Hours**

EXPERIMENT 5
Implementation of Data Clustering Algorithms

6 **5 Hours**

EXPERIMENT 6
Implementation of Web Mining Algorithms

7 **5 Hours**

EXPERIMENT 7
Implementation of Text Mining Algorithms

Total: 30 Hours

Evaluation Pattern

Preparation / Pre 10	5
Experiment & Results / E&R 10	10
Record / Observation / RO 10	5
Test -Cycle I / TCI 50	15
Test-Cycle II / TCII 50	15

15IT609 TECHNICAL SEMINAR II 0 0 2 1

Course Objectives

- Promote presentation skills and import a knowledgeable society
- Develop the ability to perform critical readings of their own writing and the writing of others.

Programme Outcomes (POs)

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Refer and utilize various technical resources available from multiple fields.
2. Improve the technical presentation and communication skills.
3. Analyze the importance of intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.
4. Interact and share their technical knowledge to enhance the leadership skills
5. Prepare report and present oral demonstrations

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2				2								
2					1			3	3	2		2		
3										3		1		
4		2				2		1	2	2		1		
5								2	2	2		2		

Total: 0 Hours

Evaluation Pattern

Presentation I / PrI 25	25
Presentation II / PrII 25	25

15IT610 MINI PROJECT IV **0 0 2 1**

Course Objectives

- Write correctness proofs for algorithms
- Apply data mining algorithms to build analytical application

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
4. Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
5. Prepare report and present oral demonstrations

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Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		3	2			2	1							
2	2	2	1	3		2					2	2		
3			3	2	2			2			2	2		
4		1		2	3	1	2	2						
5									3	3		2		

Total: 0 Hours

Evaluation Pattern

Review I / RI 25	25
Review II / R 25	25
Report / Report 50	25
Presentation&Viva Voce / PVV 50	25

15GE611 LIFE SKILLS: APTITUDE II 0 0 2 0

Course Objectives

- The undergraduate students to such methods and practices that help, develop and nurture qualities such as character, effective communication, aptitude and holding ethical values

Programme Outcomes (POs)
Course Outcomes (COs)

1. Perform arithmetical operations with complex numbers
2. Explain the meanings of a relation defined on a set, an equivalent relation and a partition of a set
3. Calculate percentages in real life contexts , find any percentage of a given whole using their knowledge of fraction multiplication and increase / decrease a given whole by a percentage
4. Demonstrate the situations like motion in as straight line,Boats and Streams, Trains, Races and clocks
5. Evaluate the Counting techniques, Permutation and Combination, Recursion and generating functions

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	2													
3	1	2												
4	1	3												
5	1	2												

1 **3 Hours**

UNIT 1 NUMBER SYSTEMS

Introduction - definition- classification on Numbers -power cycles and remainders - short cut process - concept of highest common factor - concept of least common multiple - divisibility - number of zeros in an expression

2 **3 Hours**

UNIT 2 PERCENTAGES

Introduction - definition and Utility of percentage - importance of base/denominator for percentage calculations - concept of percentage values through additions - fraction to percentage conversion table

3 **3 Hours**

UNIT 3 AVERAGES

Introduction - average of different groups - addition or removal of items and change in average- replacement of some of the items

4 **3 Hours**

UNIT 4 RATIO, PROPORTIONS AND VARIATION

Introduction- Ratio- properties-dividing a given number in the given ratio - comparison of ratios - proportions - useful results on proportion- continued proportion - relation among the quantities more than two - variation

5 **3 Hours**

UNIT 5 PROFIT AND LOSS

Gain/Loss and percentage gain or percentage loss-multiplying equivalents to find sale price - relation among cost price, sale price, gain/loss and percentage gain or percentage loss - an article sold at two different selling price - two different articles sold at same selling price - percentage gain or percentage loss on selling price - percentage gain or percentage loss on whole property

6 **3 Hours**

UNIT 6 TIME AND WORK

Introduction - Basic concepts -Concepts on working with different efficiency - Pipes and Cisterns - Work Equivalence (Man Days) -Alternative approach

7 **3 Hours**

UNIT 7 TIME, SPEED AND DISTANCE

Definition - Basics of Time, Speed and Distance - Relative speed - Problems based on Trains? Problems based on Boats and Streams -Problems based on Races - time taken with two difference modes of transport - time and distance between two moving bodies

8 **3 Hours**

UNIT 8 PERMUTATION AND COMBINATION

Definition - Fundamental rules - Theorems on Permutation - Theorems on Combination

9 **3 Hours**

UNIT 9 PROBABILITY

Concept and importance of probability - underlying factors for Real- Life estimation of probability - Basic facts about probability - some important consideration while defining event.

10 **3 Hours**

UNIT 10 MIXTURES AND ALLIGATION

Definition - alligation rule - mean value (cost price) of the mixture - some typical situations where allegation can be used.

Total: 30 Hours

Reference(s)

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
3. Dr.R S Aggarwal, Quantitative Aptitude, Seventh Revised Edition, S.Chand Publishing Company Ltd, 2013.
4. Edgar Thorpe , Course In Mental Ability And Quantitative Aptitude For Competitive Examinations, Third Edition, Tata McGraw-Hill Publishing Company Ltd, 2013
5. Arun Sharma, How to prepare for Quantitative Aptitude for the CAT, Fifth Edition, Tata McGraw-Hill Publishing Company Ltd, 2013

Evaluation Pattern

Periodical Test II / PT2 50 Periodical Test I / PT1 50	50
Final Examination (LS) / FLS 100	50

15GE601 PROFESSIONAL ETHICS 2 0 0 2

Course Objectives

- To understand Human values, ethical theory, codes of ethics, work place responsibilities, rights, engineering experimentation, global issues and contemporary ethical issues.
- To understand personal ethics, legal ethics, cultural associated ethics and engineerÃ¢??s responsibility

Programme Outcomes (POs)
Course Outcomes (COs)

1. Articulate engineering ethics theory with sustained lifelong learning to strengthen autonomous engineering decisions
2. Be an example of faith, character and high professional ethics, and cherish the workplace responsibilities, rights of others, publicÃƒÂ¢??s welfare, health and safety
3. Contribute to shape a better world by taking responsible and ethical actions to improve the environment and the lives of world community
4. Fortify the competency with facts and evidences to responsibly confront moral issues raised by technological activities, and serve in responsible positions of leadership
5. Be Proficient in analytical abilities for moral problem solving in engineering situations through exploration and assessment of ethical problems supported by established experiments

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2						2	1					
2	1	2						2	3				1	
3		2							3					2
4		1							1					
5		1						3						

UNIT I **6 Hours**

HUMAN VALUES

Morals and Ethics - Honesty - Integrity - Values - Work Ethic - Civic Virtue - Respect for Others - Living Peacefully - Caring and Sharing - Self-Confidence - Courage - Co-operation - Commitment - Empathy.

UNIT II **6 Hours**

ENGINEERING ETHICS AND PROFESSIONALISM

Scope of 'Engineering Ethics'- Variety of moral issues - Types of inquiry - Accepting and sharing responsibility - Ethical dilemmas - Moral autonomy - Kohlberg's and Gilligan's theory - Consensus and controversy - Profession and Professionalism - Models of Professional Roles - Right action theories - Senses of corporate responsibility - Codes of ethics: Importance - justification - limitation - Abuse - Sample codes NSPE - IEEE - Institution of Engineers (India).

UNIT III **6 Hours**

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation - Engineers as responsible experimenters - Balanced outlook on law - Cautious optimism - Safety and risk - Assessing and reducing risk - Safe exits - The Challenger case study - Bhopal Gas Tragedy - The Three Mile Island and Chernobyl.

UNIT IV **6 Hours**

WORKPLACE RESPONSIBILITIES AND RIGHTS

Fundamental Rights - Responsibilities and Duties of Indian Citizens - Teamwork - Ethical corporate climate - Collegiality and loyalty - Managing conflict - Respect for authority - Collective bargaining - Confidentiality - Conflicts of interest - Occupational crime - Professional rights - Employee rights.

UNIT V **6 Hours**

GLOBAL ISSUES

Multinational corporations: Technology transfer and appropriate technology - International rights - promoting morally just measures - Environmental ethics: Engineering, ecology - economics - Human and sentient centred - and bio and eco centric ethics - Computer ethics and internet - Engineers as managers - Consulting engineers - Engineers as expert witnesses and advisors - Moral leadership.

FOR FURTHER READING

The Challenger case study - Bhopal Gas Tragedy - The Three Mile Island and Chernobyl case studies - Fundamental Rights, Responsibilities and Duties of Indian Citizens -Sample code of ethics like IETE, ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management.

Total: 30 Hours

Reference(s)

1. Mike W Martin and Roland Schinzinger, Ethics in Engineering, 4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi, 2014.
2. M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi, 2012.
3. R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited, New Delhi,2006.
4. Charles D Fleddermann, Engineering Ethics, Pearson Education/ Prentice Hall of India, New Jersey, 2004.
5. Charles E Harris, Michael S Protchard and Michael J Rabins, Engineering Ethics - Concepts and Cases, Wadsworth Thompson Learning, United States, 2005.
6. http://www.slideworld.org/slidestag.aspx/human-values-and- Professional-ethics

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	5	5				5					5														20
2		5			5						5										5				20
3		5					10				5														20
4	5									5											5	5			20
5	5					5				5					5										20
Total																									100

Assessment Questions
Remember

1. Define Human Values.
2. What are Morals and Values?
3. What do you mean by Civic virtue and Respect for others?
4. Write the various meanings of ï¿½??Spirituality?
5. List four different types of Virtues.
6. Mention different Human values.
7. What is meant by moral autonomy?
8. Classify the types of inquiry
9. What are the steps needed in confronting moral dilemmas?
10. List the levels of moral development suggested by Kohlberg
11. What do you understand by self-interest and ethical egoism?
12. What are the steps needed in confronting moral dilemmas?
13. What are the three virtues of religion?
14. What are the professional responsibilities?

Understand

1. Which are the practical skills that will help to produce effective independent thought about moral issues?
2. Why does engineering have to be viewed as an experimental process?
3. Why isn‘t engineering possible to follow a random selection in product design?
4. Why is the code of ethics important for engineers in their profession?
5. What does the Balanced Outlook on Law stress in directing engineering practice?
6. Are the engineers responsible to educate the public for safe operation of the equipment? How?
7. What kind of responsibility should the engineer have to avoid mistakes that may lead to accident due to the design of their product?
8. What is the use of knowledge of risk acceptance to engineers?
9. Why is Environmental Ethics so important to create environmental awareness to the general public?
10. Why do the engineers refuse to do war works sometimes?

Apply

1. How does the consideration of engineering as a social experimentation help to keep a sense of autonomous participation is a person’s work?
2. How does the code of ethics provide discipline among the engineers?
3. Exemplify the space shuttle Challenger case accident?
4. How does the manufacturer understand the risk in a product catalog or manual?
5. How does the knowledge of uncertainties in design help the engineers to access the risk of a product?
6. How can the quantifiable losses in social welfare resulting from a fatality be estimated? Give some examples.
7. How does the engineer act to safeguard the public from risk?

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT702 GRAPHICS AND MULTIMEDIA 3 0 0 3

Course Objectives

- Provide in-depth knowledge of display systems, image synthesis and shapes
- Understand basic concepts related to Multimedia including data standards, algorithms and software
- Develop multimedia applications by utilizing existing libraries

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Identify and apply the suitable primitive algorithms to draw the basic geometric shapes.
2. Apply the 2D transformations for traditional printing and drawing technologies of real time applications.
3. Create interactive graphics applications using 3D modeling and transformation techniques.
4. Create multimedia applications using texts, fonts and animations for real time problems.
5. Develop digital movies with animation using multimedia software tools.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3	2										3	
2	1	2	3		3								3	
3	1	3	2										3	
4	1	3	2		2								2	
5	1	3	2		1						-		1	

UNIT I **9 Hours**

GRAPHICS FUNDAMENTALS

Introduction -Graphics Standards - Line - Circle and Ellipse Drawing Algorithms - Attributes - Introduction to Two-Dimensional Geometric Transformations - Two Dimensional Clipping and Viewing.

UNIT II **9 Hours**

TWO DIMENSIONAL GRAPHICS

Two dimensional geometric transformations - Matrix representations and homogeneous coordinates, composite transformations: windowto-viewport coordinate transformation, Two dimensional viewing functions: clipping operations-Point Clipping - Line Clipping: Cohen Sutherland, Liang Barsky - Polygon Clipping: Sutherland Hodgeman.

UNIT III **9 Hours**

THREE DIMENSIONAL GRAPHICS

Three dimensional concepts: Three dimensional object representations - Polygon surfaces - Polygon tables - Plane equations - Polygon meshes: Curved Lines and surfaces, Quadric surfaces: Blobby objects Spline representations - Bezier curves and surfaces - B-Spline curves and surfaces.

UNIT IV **9 Hours**

ANIMATION

Text: Using Text in Multimedia, computer and text, Font Editing and design tools, hypermedia and hypertext - Image: Making Still Images, color, Image File format, Principles of Animation, animation by computer, making animation - Video: Digital video containers, shooting and editing video.

UNIT V **9 Hours**

MULTIMEDIA

Basic software tools - Text, image, and sound editing tools - painting and drawing tools, animation tools - making instant multimedia - Office suite - Multimedia authoring tools : Types,card and page based authoring tools, icon and time based authoring tools.

FOR FURTHER READING

Multimedia systems and Applications - Multimedia communication systems - Databases - Synchronization issues - Presentation requirements - Video conferencing - Virtual reality - Augmented Reality -Interactive video.

Total: 45 Hours

Reference(s)

1. Donald Hearn and M Pauline Baker, Computer Graphics, Pearson Education, 2nd Edition, 2013.
2. Prabhat K Andleigh and Kiran Thakrar, Multimedia systems design, PHI, 2011.
3. Tay Vaughan, MULTIMEDIA Making It Work, Tata McGraw-Hill, 8th Edition, 2012.
4. Ze-Nian Li, Mark S Drew, Fundamentals Of Multimedia, PHI, 2004.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	4			2	6								2											18
2		2	2			6				2					8										20
3	2	2					4			2				2	6			4							22
4		2	2				6								6								4		20
5		2				4				2				4	4							4			20
Total																									100

Assessment Questions
Remember

1. List the three Graphics Software Standards.
2. The Cartesian slope-intercept equation for a straight line is
   a. y = mx + c
   b. y = bx + m
   c. y = xx + m
   d. y = b + mm
3. Give the Equation for window port to viewport transformation?
4. Mention any five applications of computer graphics in industry.
5. The simplest output primitive is .....
   a) Straight line b) Straight line segment c) Point d)Circle
6. Which of the following is not a graphics standards.....
   a. Graphics Kernel system
   b. PHIGS
   c. PHIGS+
   d. GKS+
7. A straight line segment is translated by applying the transformation equation
   a) P'=P+T
   b) Dx and Dy
   c) P'=P+P
   d) P'=P-P
8. List any three Two dimensional viewing functions with correct syntax ?
9. List the types of database replication?
10. List out the building blocks of multimedia

Understand

1. Explain the working principle of CRT
2. Summarize the steps followed in DDA line drawing algorithm.
3. Draw the block diagram of pipeline transforming a view of world coordinate scene to device coordinate
4. Compare parallel projection with perspective projection and derive their projection matrices.
5. State the advantages of B spline curve over Beizer curve for generating curve
6. Exemplify bezier curve with their properties.
7. Classifiy the two types of chunks specified by the MIDI format.
8. Compare and contrast hyper media and hyper text
9. Describe the different aspects of integrated multimedia standards
10. What are the services provided by the directory service agent?

Apply

1. Why Octant symmetry property cannot be applied in Ellipse drawing process?
2. Explain the Octant symmetry property. How it is applied in drawing a circle?
3. Design a block diagram of a pipeline for transforming a view of world coordinate scene to device coordinate.
4. Assess why Quadratic surfaces are frequently used?
5. Demonstrate packet loss in multimedia communication?
6. Assess the main functions of a Multimedia development system
7. Demonstrate the need of optical storage media with suitable reasons.
8. Assess the design issues for multimedia authoring
9. Demonstrate oblique and orthogonal projections.

10. Apply Bresenham's line drawing algorithm and plot the points of a line going from (20,10) to (30,18).

Analyse

1. Differentiate between the Random scan and Raster Scan display.
2. Compare DDA Line Algorithm with Bresenham's line algorithm.
3. The Disadvantage of line DDA is .....
   a. Time consuming
   b. Faster
   c. More Efficient
   d. Simpler Mathematical calculations
4. Differentiate oblique and orthogonal projections.
5. Differentiate between interpolation spline and approximation spline.
6. Differntiate bezier curves and B-spline curves
7. Assess the efficiency of B spline curve over beizer for generating curve

Evaluate

1. If a point (x,y) is reflected about an axis which is normal to the XY plane and passing through the origin, the reflected point (X,Y) is:-
   a) (x,-y) b) (-x,y) c) (-x,-y) d) (y,x)
2. Why Octant symmetry property cannot be applied in Ellipse drawing process?
3. How the 1st Quadrant in Ellipse is drawn using the Mid-Point ellipse Algorithm?

Create

1. List the steps to Perform image editing using basic tool, masking effect and rendering effects using Photoshop
2. Explain the Mid point algorithm to generate the ellipse. Take the data Radius-x = 8 and Radius-Y = 6 and plot all the points of a ellipse in the first Quadrant.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT703 XML AND WEB SERVICES 3 0 0 3

Course Objectives

- Learn the XML Technologies and modeling databases in XML
- Provide an overview of Service Oriented Architecture and the importance of Web services

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Apply XML manipulation technologies such as XSLT, XPath, XLink and XHTML to develop web applications
2. Design SOA Applications using XML and Web Services
3. Implement an application that uses multiple web services in a realistic business scenario
4. Design an Application using the principles of SOAP and REST based web services
5. Use the security approaches to provide security for XML documents and the Messages exchanged among web services

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2		1	2								2	
2	1	2			3	2							2	
3	1	2	2		3	2							2	
4	1	2			2	2					2		2	
5	1	2			2	2					2		2	

UNIT I **10 Hours**

XML TECHNOLOGY

Role of XML - XML and The Web - XML Language Basics - XML benefits - Advantages of XML over HTML - EDI - Databases - XML standards - DTD - XML Schemas - XML processing - DOM - SAX - presentation technologies - XSL - XFORMS - XHTML - Transformation - XSLT - XLINK - XPATH.

UNIT II **8 Hours**

SOA BASICS

Service Oriented Architecture (SOA) - Comparing SOA with Client-Server and Distributed architectures - Characteristics of SOA - Benefits of SOA - Principles of Service orientation - Service layers - Business Process management.

UNIT III **9 Hours**

ARCHITECTING WEB SERVICES

Business motivations for web services - B2B - B2C - limitations of CORBA and DCOM - Architecting web services - Implementation view - web services technology stack - logical view - composition of web services - deployment view - process view.

UNIT IV **10 Hours**

WEB SERVICES BUILDING BLOCKS

Transport protocols for web services - messaging with web services protocols - SOAP - describing web services: WSDL - Anatomy - manipulation - web service policy - Discovering web services: UDDI - Anatomy - Web service inspection - Introduction to RESTful Web Services

UNIT V **8 Hours**

XML AND WEB SERVICES SECURITY

XML Security Overview - Canonicalization - XML Security Framework - XML Encryption - XML Signature - XKMS Structure - Web Services Security - XACML.

FOR FURTHER READING

RDF - OWL - Semantic Web - Case study: Success with SOA and Web services, PROTEGE.

Total: 45 Hours

Reference(s)

1. Ron Schmelzer, XML and Web Services, Pearson Education, 2008.
2. Frank P Coyle, XML, Web Services and the Data Revolution, Pearson Education, 2002.
3. Thomas Erl,Service Oriented Architecture: Concepts, Technology and Design, Pearson Education, 2005.
4. Sandeep Chatterjee and James Webber, Developing Enterprise Web Services: An Architects Guide, Prentice Hall, 2004.
5. Ramesh Nagappan, Robert Skoczylas and Rima Patel Sriganesh, Developing Java Web Services, Wiley Publishing Inc., 2007.
6. http://www.w3schools.com/xml/

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4					6				4								4				2			20
2		6				6				2				6											20
3	4	6					6							6											22
4	2					4	4				6			2											18
5		6					6								6							2			20
Total																									100

Assessment Questions

Remember

1. Define XML.
2. State the role of XML in web application
3. Does SOAP Require the Web and Network?
4. Recognize when SOAP faults will occur?
5. List the limitations of CORBA and DCOM.
6. Name the major aspects of Web service technologies.
7. List the WDSL extensibility elements documents.
8. Define SMIL modularization.
9. State canonicalization.
10. List the guidelines for signing XML documents.

Understand

1. Classify the 3 different XML revolutions.
2. Identify the Transformation techniques.
3. Illustrate the concept of SOAP fault.
4. Summarize SOAP characteristics.
5. Explain the two steps to invoking a Web Service.
6. Interpret the concept of using Quality of Service and Reliable Messaging in SOA.
7. Explain the technical architecture of ebXML.
8. Represent the organization of UDDI.
9. Explain the applications of XML as occurring in three waves.
10. Compare the three basic security requirements for e-business and explain.

Apply

1. Write a CSS that makes all text three times larger than the base font and the font color is red.
2. Demonstrate the procedure to create an external DTD with an example.
3. Predict the reason why SOAP is important?
4. Write the SOAP Encoding techniques.
5. Implement the architectural view of web services technology stack with block diagram.
6. What is mean by B2B &B2C and explain the business and technical motivations for web services with detail.
7. Illustrate the types of XML signatures and cannibalization.
8. Write a DTD for mark statement of a student.
9. Show a simple code snippet to encrypt XML.
10. Implement XML digital signature.

Analyse

1. Differentiate DTD and XML Schema.
2. Compare SOAP and IIOP.
3. Integrate web service creation with database connectivity.
4. Organize a web service for adding few numbers using Net Beans and write client side code to invoke the web service.

5. Determine the concept of XACML used in XML security.

6. Create a SOA project with XSLT Module to compose a web service.
7. Justify XML messages are packaged and enveloped in a web service.
8. Discriminate the overview of SOAP Communication.
9. Determine the various web services that are used.

Evaluate

1. Write an XSLT program to extract book titles, authors, publications, book rating from the books XML document and use formatting.

Create

1. Create a XML document using elements, attributes and CDATA section.
2. Create an application to implement the Library Management System using HTML and XML.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT704 INFORMATION SECURITY 3 0 0 3

Course Objectives

- Understand how information security is practiced in computing systems
- Learn cryptographic techniques for secure data transfer and authentication
- Familiarize with the implementation of security policies and protocols

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Compare and analyze various symmetric cryptographic algorithms
2. Compare and analyze various asymmetric cryptographic algorithms
3. Analyze and apply different cryptographic algorithms to ensure message authentication
4. Identify and apply the suitable cryptographic algorithms to enable security at different layers
5. Apply ethical principles and commit to professional ethics and norms of the engineering practice

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3												
2	2	1												
3	3	1											2	
4	1	2											2	
5	3	2											1	

UNIT I **9 Hours**

SYMMETRIC CRYPTOGRAPHY

Components of Information System - Approaches to Information Security Implementation - steganography - Symmetric key Ciphers: DES structure - DES Analysis - Security of DES - variants of DES - Block cipher modes of operation - AES structure - Analysis of AES.

UNIT II **9 Hours**

ASYMMETRIC CRYPTOGRAPHY

Key distribution Asymmetric key Ciphers: Principles of public key cryptosystems - RSA algorithm, Analysis of RSA - Diffie-Hellman Key exchange.

UNIT III **9 Hours**

MESSAGE AUTHENTICATION AND HASH FUNCTIONS

Authentication requirements and functions - MAC and Hash Functions - MAC Algorithms: Secure Hash Algorithm - Whirlpool - HMAC - Digital signatures - X.509 - Kerberos.

UNIT IV **9 Hours**

SECURITY AT LAYERS(NETWORK, TRANSPORT, APPLICATION)

IPSec - Secure Socket Layer(SSL) - Transport Layer Security(TLS) - Secure Electronic Transaction(SET) - Pretty Good Privacy(PGP) - S/MIME - Firewall design principles - Types of firewalls.

UNIT V **9 Hours**

LAWS, INVESTIGATION AND ETHICS

Cyber Crime - Information Security and Law - Types & overview of Cyber Crimes - Cyber Law Issues in E-Business Management - Overview of Indian IT Act - Ethical Issues in Intellectual property rights - Copy Right - Patents - Data privacy and protection - Domain Name - Software piracy - Plagiarism - Issues in ethical hacking.

FOR FURTHER READING

Case study on Wired/Wireless Encryption Privacy-Authentication & Authorization Tools.

Total: 45 Hours

Reference(s)

1. William Stallings, Cryptography and Network Security, sixth edition, Pearson Education, 2013.
2. Michael E Whitman, Herbert J Mattord, Principles of Information Security, fourth edition, Cengage Learning, 2012.
3. Forouzan Mukhopadhyay, Cryptography and Network Security, third edition, McGraw Hill, 2015.
4. C K Shyamala, N Harini, T R Padmanabhan, Cryptography and Network Security, first edition, Wiley India, 2011.
5. Bernard Menezes, Network Security and Cryptography, fifth edition, Cengage Learning, 2010.
6. William Stallings, Cryptography and Network Security, sixth edition, Pearson Education, 2013.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2		3			2				3	2		4												16
2	3	2				2	4		4	5				4	3			2							29
3		2				3	4		4	2	3			5	3			3							29
4			4		2					7					3										16
5					4						6														10
Total																									100

Assessment Questions

Remember

1. Define information security
2. List the critical characteristics of information
3. List and explain the various components of an information system
4. What is the difference between attack and vulnerability? List and explain any seven attacks.
5. List and describe the credentials of the various information security certifications.
6. What are the threats to information security?

7. What are the multiple layers of security?
8. What are the types of information security policies?
9. What are the credentials of information security professionals.
10. What are the characteristics of CIA triangle?

Understand

1. Why is information security a management problem?
2. When can a computer be an object and subject to an attack respectively?
3. Explain the four important functions of information security in an organization?
4. Explain the ethical concepts in information security?
5. Explain the major types of attacks in detail.
6. Explain the security system development life cycle in detail.
7. Discuss the ethical concepts in information security and the prevention to illegal and unethical behaviour.
8. Decsribe the process of risk identification in detail.
9. Describe the commonly accepted information security Principles?
10. Explain the types of Attacks in detail?
11. Explain the Cryptographic algorithms in detail

Apply

1. If you had to both encrypt and compress data during transmission, which would you do first, and why?
2. In public-key cryptography you have a public and a private key, and you often perform both encryption and signing functions. Which key is used for which function?
3. What are your first three steps when securing a Linux server?
4. What are your first three steps when securing a Windows server?
5. Who's more dangerous to an organization, insiders or outsiders? Justify your answer.
6. Cryptographically speaking, what is the main method of building a shared secret over a public medium? Defend your answer.
7. How would you implement a secure login field on a high traffic website where performance is a consideration?
8. If you were a site administrator looking for incoming CSRF attacks, what would you look for?
9. What do you think theÂ primary reason most companies haven't fixed their vulnerabilities?
10. What is SSL and why is it not enough when it comes to encryption?

Analyse

1. Distinguish between symmetric and asymmetric encryption.
2. Distinguish between DoS and DDoS.
3. Differentiate Direct and Indirect attacks
4. Differentiate Private & Public Laws
5. Differentiate Preventive and Detective control
6. Compare and contrast the protocols used in Secure Internet Communication?
7. Distinguish between PKI and Hash Function.
8. Differentiate between Digital Signatures and Pretty Good Privacy
9. What's the difference between HTTP and HTML?
10. What's the difference between Diffie-Hellman and RSA?
11. What are Linux's strengths and weaknesses vs. Windows?

Create

1. Deliberate acts of Sabotage or vandalism
2. Deliberate the acts of human error or failure

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT707 GRAPHICS AND MULTIMEDIA LABORATORY

0 0 2 1

Course Objectives

- Introduced to computer graphics techniques focusing on 3D modeling, image synthesis and rendering
- Understand and demonstrate computer graphics animation
- Use basic multimedia software tools.
- Understand and demonstrate computer graphics animation

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. Implement DDA, Bresenham and Midpoint algorithm to draw Line and Circle.
2. Create Interactive graphics applications using one or more graphics application programming interfaces.
3. Write Programs that demonstrates geometrical transformations.
4. Design a basic Multimedia system using sound and video
5. Demonstrate the animated videos and images using Adobe Photoshop

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		1		2									
2	2	2	-		1				-					
3	2		2		1				-		-			
4	2		2		2						-			
5	2		2		2						-			

1 **3 Hours**

EXPERIMENT 1

Implementation of Line Drawing Using DDA Algorithm and Bresenham Algorithm

2 **3 Hours**

EXPERIMENT 2

Implementation of Circle Drawing using Midpoint Algorithm and Bresenham Algorithm

3 **3 Hours**

EXPERIMENT 3

Implementation of Ellipse Drawing

4 **3 Hours**

EXPERIMENT 4

Implementation of Basic 2D Transformations like Scaling,Rotation, Translation and Reflection

5 **3 Hours**

EXPERIMENT 5

Implementation of 3D Transformations

6 **3 Hours**

EXPERIMENT 6

Implementation of Cohen Sutherland Line Clipping Algorithm

7 **3 Hours**

EXPERIMENT 7

To Animate a Tyre running in a straight path.

8 **3 Hours**

EXPERIMENT 8

To animate flying Indian National Flag.

9 **3 Hours**

EXPERIMENT 9

To perform a morphing effect of crying face to sad face to happy face and last to most happiest face.

10 **3 Hours**

EXPERIMENT 10

Edit a Photo by applying various effects. use adobe Photoshop.

Total: 30 Hours

Reference(s)

1. Donald Hearn & M. Pauline Baker, Computer Graphics, Pear son Education, 2nd Edition, 2013
2. Prabhat K Andleigh and Kiran Thakrar, Multimedia systems design, PHI, 2011
3. Tay Vaughan, MULTIMEDIA Making It Work, Tata McGraw-Hill, 8th Edition,2012.

Evaluation Pattern

Preparation / Pre 10	5
Experiment & Results / E&R 10	10
Record / Observation / RO 10	5
Test -Cycle I / TCI 50	15
Test-Cycle II / TCII 50	15

15IT708 XML AND WEB SERVICES LABORATORY 0 0 2 1

Course Objectives

- Provide the technologies for building and modeling XML documents
- Build web services using JAX RPC and WS

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Create XML document structure for storing and Transporting data
2. Use DTD,XSD and XSL to validate and model the XML document structure
3. Demonstrate the use of XML document for various web services.
4. Develop web services with SOA design principles.
5. Build XML document for various web services.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		1		2									
2	2	2			1									
3	2		2		1									
4	3		2		2								1	
5	3		2		2									

1 **3 Hours**

EXPERIMENT 1

XML document creation

2 **3 Hours**

EXPERIMENT 2

Importing and Exporting XML document in database

3 **3 Hours**

EXPERIMENT 3

Create an XML document and validate it using XML schema to store library book details and create the DTD files.

4 **3 Hours**

EXPERIMENT 4

Validating XML with Internal and External DTD

5 **3 Hours**

EXPERIMENT 5

Rendering XML with XML Schema

6 **3 Hours**

EXPERIMENT 6

Parsing XML document using DOM/SAX parser

7 **3 Hours**

EXPERIMENT 7

Web Service creation using SOAP and RESTful Web Services

8 **6 Hours**

EXPERIMENT 8

Building Web Services with JAX-RPC

9 **6 Hours**

EXPERIMENT 9

Write a SQL statement to create a table named countries including columns country_id, country_name and region_id and make sure that no countries except Italy, India and China will be entered in the table. (Use Postgres)

10 **6 Hours**

EXPERIMENT 10

Design and implement Automatic Backup of Files and Recovery of Files.(Use MYSQL database)

11 **6 Hours**

EXPERIMENT 11

Design and implement banking system. (Use Oracle Database)

Total: 45 Hours

Reference(s)

1. Ron Schmelzer, XML and Web Services, Pearson Education, 2008.
2. Alexander Nakhimovsky and Tom Myers, XML Programming: Web Applications and Web Services with JSP and ASP, Apress, 2002.
3. http://csis.pace.edu/~lixin/pclc/ws/webServiceLab.zip

Evaluation Pattern

Preparation / Pre 10	5
Experiment & Results / E&R 10	10
Record / Observation / RO 10	5
Test -Cycle I / TCI 50	15
Test-Cycle II / TCII 50	15

15IT709 MINI PROJECT V 0 0 2 1

Course Objectives

- Test and validate the conformance of the developed prototype against the original requirements of the problem
- acquire practical knowledge within the chosen area of technology for project development

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Formulate a real world problem, identify the requirement and develop the design solutions. systematic approach
2. Identify technical ideas, strategies and methodologies
3. Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project
4. Test and validate through conformance of the developed prototype and analysis the cost effectiveness
5. Prepare report and present oral demonstrations

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		3	2			2	1							
2	2	2	1	3		2					2	2		
3			3	2	2			2			2	2		
4		1		2	3	1	2	2						
5									3	3		2		

Total: 0 Hours

Evaluation Pattern

Review I / RI 25	25
Review II / R 25	25
Report / Report 50	25
Presentation&Viva Voce / PVV 50	25

15GE710 LIFE SKILLS : COMPETITIVE EXAMS 0 0 2 0

Course Objectives

- Understand the concepts of applied mechanics, theory of machines and design.
- Understand the concepts of fluid mechanics and thermal engineering.
- Understand the concepts of materials, manufacturing and industrial engineering.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Solve the problems related to applied mechanics, Theory of Machines and Design concepts
2. Solve the problems related to Fluid Mechanics and Thermal Engineering
3. Explain the concepts of Materials, Manufacturing and Industrial Engineering.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		3											
2	2		3											
3	1		3											

1 **10 Hours**

UNIT 1

Engineering Mechanics-Statics and Dynamics, Mechanics of Materials- deflection of beams, testing of materials, Theory of Machines- Kinematics and Dynamics, Vibrations, Machine Design- design of machine elements, shafts, gears, rolling and sliding contact bearings, brakes and clutches, springs.

2 **10 Hours**

UNIT 2

Fluid Mechanics, Thermodynamics, Heat-Transfer-conduction, convection and radiation, Power Engineering: Air and gas compressors, I.C. Engines, refrigeration, air-conditioning, Turbomachinery.

3 **10 Hours**

UNIT 3

Engineering Materials, Casting, Forming and Joining Processes, Machining and Machine Tool Operations, Metrology and Inspection, Computer Integrated Manufacturing, Production Planning and Control, Inventory Control, Operations Research.

Total: 30 Hours

Reference(s)

1. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India Learning Pvt. Ltd, New Delhi, 2010
2. Y. Cengel and Boles, Thermodynamics - An Engineering Approach, Tata McGraw Hill Publishing Company Pvt. Ltd, New Delhi,2003.
3. R.K. Bansal, A Textbook of Fluid Mechanics and Machinery, Laxmi Publications Ltd., New Delhi, Revised Ninth edition, 2014.
4. V. B. Bhandari, Design of Machine Elements, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi, 2010.

5. Beer, Johnston, Mazurek, Cornwells and Sanghi, Vector Mechanics for Engineers: Statics, Dynamics, 10th Edition, Tata McGraw Hill - Noida, Uttar Pradesh, 2013
6. Behrouz A.Forouzan, Data Communication and Networking, 5th Edition, Tata McGraw-Hill, 2014.

Evaluation Pattern

Periodical Test II / PT2 50 Periodical Test I / PT1 50	50
Final Examination (LS) / FLS 100	50

15IT804 PROJECT WORK 0 0 0 9

Course Objectives

- Encourage teamwork and interaction between students.
- Encourage multidisciplinary research through the integration of material learned in a number of courses.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Apply their knowledge of basic science and engineering fundamentals throughout the course
2. Demonstrate the skills by delivering a product that has passed through the design, analysis, testing and evaluation stages.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		3							3				
2			2		3									

Total: 0 Hours

Evaluation Pattern

Review I - Literature survey / RILS 10	10
Review I-Problem Identification / RIPI 5	5
Review-I Methodology / Method 10	10
Review-II Continuation in Methodology / CM 10	10
Review II- Results / Progress / RP 15	15

15LE101 BASIC ENGLISH I 3 0 0 3

Course Objectives

- To teach students basic English vocabulary and tenses
- To offer practice on various conversation patterns
- To improve spelling and pronunciation by offering rigorous practice and exercises

Programme Outcomes (POs)
Course Outcomes (COs)

1. Students will be able to: Form sentences using basic grammar and vocabulary in English
2. Involve in basic day-to-day conversation
3. Express opinions, agree & disagree on topics of general interest
4. Listen and understand Indian English audio clippings
5. Understand reading comprehension passages and answer related questions

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	2													
3	1	2												
4	2	1												
5		1	1											

UNIT I **7 Hours**

UNIT I

Module Vocabulary/ Grammar Skills Sets Skill Sets
1 Basic words- 12 most used words in English, usage and pronunciation Starting a conversation and talking about what one does Sentence construction bolstered by mother tongue
2 Basic words- 20 often used words, usage and pronunciation Analyzing an action plan Creating and presenting own action plan
3 Basic words with a focus on spelling Discriminative listening Informal conversation
4 Basic words- 10 often used words, usage and pronunciation Content listening and Intonation Reading comprehension
5 Unit Test I

UNIT II **8 Hours**

UNIT II

Module Vocabulary/ Grammar Skills Sets Skill Sets
6 Basic words + greetings to be used at different times of the day Formal conversation Intonation to be used in formal address
7 Last 28 of the 100 most used words Informal conversation between equals Reading practice and peer learning
8 Using the 14 target words to form bigger words Informal dialogues using contracted forms Guided speaking- talking to peers using contracted forms
9 Palindromes, greetings- good luck, festivals Placing a word within its context- culling out meaning

Offering congratulations
10 Unit Test II

UNIT III **7 Hours**

UNIT III

Module Vocabulary/ Grammar Skills Sets Skill Sets
11 Homophones Formal and informal methods of self-introduction Let's Talk is a group activity that gives them some important pointers of speech
12 Homophone partners, matching words with their meanings Contracted forms of the -be verbs, -ve and -s Translating English sentences to Tamil
13 Briefcase words- finding smaller words from a big word Formal and informal ways of introducing others Team work- speaking activity involving group work, soft skills
14 Compound words and pronunciation pointers Giving personal details about oneself using the lexicon
15 Unit Test III

UNIT IV **8 Hours**

UNIT IV

Module Vocabulary/ Grammar Skills Sets Skill Sets
16 Proper and common nouns Asking for personal information and details Pronunciation pointers- an informal introduction to the IPA
17 Pronouns Telephone skills and etiquette Reading aloud and comprehension
18 Abstract and common nouns Dealing with a wrong number Reading practice and comprehension
19 Group names of animals, adjectives Taking and leaving messages on the telephone Pronunciation pointers
20 Unit Test IV

UNIT V **8 Hours**

UNIT V

Module Vocabulary/ Grammar Skills Sets Skill Sets
21 Determiners Interrupting a conversation politely- formal and informal Pair work reading comprehension
22 Conjugation of the verb to be- positive and negative forms Thanking and responding to thanks Comprehension questions that test scanning, skimming and deep reading
23 Am/is/are questions Giving instructions and seeking clarifications Small group activity that develops dialogue writing
24 Present continuous tense-form and usage Making inquiries on the telephone Finishing sentences with appropriate verbs
25 Unit Test V

UNIT VI **7 Hours**

UNIT VI

Module Vocabulary/ Grammar Skills Sets Skill Sets
26 Words with silent 'b'
Present continuous questions Calling for help in an emergency Dialogue writing
27 Words with silent 'c' Simple present tense- form and usage Making requests and responding to them politely Identifying elements of grammar in text extract
28 Simple present tense- rules Describing people Guided writing
29 Words with silent 'g'
Questions in the simple present tense Describing places Filling in the blanks with correct markers of tense
30 Unit Test VI

Total: 45 Hours

Reference(s)

1. 1. Basic English Module, L&L Education Resources, Chennai, 2011.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
6																									0
Total																									0

Assessment **Questions**

Evaluation Pattern

Oral Exam / OE 50	50
Test 1 - Speaking / T1-S 10	5
Test 1 - Reading / T1-R 10	5
Test 1 - Writing / T1-W 10	5
Test 1 - Listening / T1-L 10	10
Test 2 - Speaking / T2-S 10	5
Test 2 - Reading / T2-R 10	5
Test 2 - Writing / T2-W 10	5
Test 2 - Listening / T2-L 10	10

15LE102 COMMUNICATIVE ENGLISH I 3 0 0 3

Course Objectives

- To communicate effectively in social scenario
- To enhance the ability of reading, summarising and paraphrasing information
- To develop the techniques of writing through appropriate use of grammar and vocabulary

Programme Outcomes (POs)
Course Outcomes (COs)

1. Listen and comprehend different spoken discourses
2. Communicate ideas in English fluently during personal / official conversations
3. Use grammar and vocabulary required at CEFR B1 level in spoken and written discourses
4. Read and understand general & technical text
5. Involve in formal written communication using appropriate mechanics of writing

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	1	2												
3		1												
4	1	2												
5		2												

UNIT I **9 Hours**

UNIT I: GRAMMAR

Content words- Structural words - Subject - Verbs and verb phrase - Subject - Verb agreement - Tenses - Active voice and passive voice - Sentence types (declarative, imperative, exclamatory & interrogative) - Framing questions - Comparative adjective

UNIT II **9 Hours**

UNIT II: LISTENING

Listening for specific information: Short conversations / monologues - Impersonal passive - Gap filling - Telephone conversations - Note-taking - Listening for gist / interviews - Listening to songs and completing the lyrics - Clear individual sounds - Telephone etiquette

UNIT III **9 Hours**

UNIT III: READING

Prediction - Skimming for gist - Scanning for specific information - Understanding text and sentence structure - Note Making

UNIT IV **9 Hours**

UNIT IV: WRITING

Letter Writing: Formal letters / Job application - E-mail writing Ã¢?? Report & Proposal writing - Advertisement - Principles of writing a good paragraph: Unity, cohesion and coherence - Paragraph writing (descriptive, narrative, expository & persuasive)

UNIT V **7 Hours**

UNIT V: SPEAKING

Self-introduction (Elevator Pitch) - Giving personal and factual information - Talking about present circumstances, past experiences and future plans - Mini-presentation - Expressing opinions and justifying opinions - Likes and dislikes - Tongue twisters

FOR FURTHER READING

Short stories:
"The Astrologer's Day" by R. K Narayan
"How Much Land does a Man Need?" by Leo Tolstoy

Total: 43 Hours

Reference(s)

1. Murphy, Raymond. English Grammar in Use - A Self-Study Reference and Practice Book For Intermediate Learners Of English .IVed. United Kingdom: Cambridge University Press. 2012.
2. 2.Seely, John. Oxford Guide to Effective Writing and Speaking. Indian edition. New Delhi: Oxford University Press. 2005.
3. 3. Anderson, Kenneth. Study Speaking: A Course in Spoken English for Academic Purposes. United Kingdom: Cambridge University Press. 2004.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Oral Exam / OE 50	50
Test 1 - Speaking / T1-S 10	5
Test 1 - Reading / T1-R 10	5
Test 1 - Writing / T1-W 10	5
Test 1 - Listening / T1-L 10	10
Test 2 - Speaking / T2-S 10	5
Test 2 - Reading / T2-R 10	5
Test 2 - Writing / T2-W 10	5
Test 2 - Listening / T2-L 10	10

15LE201 BASIC ENGLISH II 3 0 0 3

Course Objectives

- To focus on natural acquisition of rudimentary structures in English language through ample listening, reading and writing inputs
- To concentrate on speaking and conversation skills with a view to increase fluency in speaking
- To enhance the ability of correct pronunciation and spelling

Programme Outcomes (POs)
Course Outcomes (COs)

1. The students will be able to: Express themselves clearly in English to individuals / groups without hesitation
2. Comprehend simple day-to-day formal/ informal conversations
3. Use various forms of tenses in speaking and writing
4. Read and understand paragraphs on simple topics
5. Write coherent paragraphs / reports / letters on familiar topics

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		1												
3		1												
4	1	2												
5		2												

UNIT I **8 Hours**

UNIT I

Module Vocabulary/ Grammar Skills Sets Skill Sets
31 Difference between Present Continuous and Simple Present tense. Calling for help in an emergency Reporting an event- journalistic style
32 Verbs 'have' and 'have got' Describing animals Asking for and giving directions
33 Simple Past Tense Inviting people, accepting and declining invitations Self-enquiry and offering one's opinion on a given topic.
34 Spelling rules & table of Irregular Verbs Refusing an invitation Reading and practicing pre-written dialogues
35 Unit Test I

UNIT II **8 Hours**

UNIT II

36 Questions and the negative form of the simple past tense Apologizing and responding to an apology (Reading) conversation practice
37 Asking questions in the simple past tense Reading comprehension Seeking, granting and refusing permission
38 Past continuous tense Paying compliments and responding to them Pair work: writing dialogues and presenting them
39 Difference between simple past and past continuous- when and where to use each Describing daily

routines Reading and comprehension skills
40 Unit Test II

UNIT III **7 Hours**

UNIT III

41 Simple future tense Talking about the weather Making plans- applying grammar theory to written work
42 Simple future tense- more aspects, possessive pronouns Talking about possessions Opening up and expressing one's emotions
43 Future continuous tense Talking about current activities Listening comprehension
44 Revision of future tense- simple and continuous forms, prepositions used with time and date Asking for the time and date Discussion- analyzing and debating a given topic
45 Unit Test III

UNIT IV **8 Hours**

UNIT IV

46 Articles a/an Writing, speaking and presentation skills Transcribing dictation
47 Singular- Plural (usage of a/an) Reading practice- independent and shared reading Comprehension - logical analysis, process analysis and subjective expression
48 Countable and uncountable nouns- a/an and some Listening comprehension Vocabulary: using context tools to decipher meaning
49 Articles- the Sequencing sentences in a paragraph Listening to a poem being recited, answer questions on it and practice reciting the same
50 Unit Test IV

UNIT V **7 Hours**

UNIT V

51 Articles- the: usage and avoidance Speaking: sharing stories about family, village/town, childhood, etc. 10 students Listening: comprehend and follow multiple step instructions read out by the teacher

52 Articles- the: usage and avoidance with like and hate Speaking: sharing stories about family, village/town, childhood, etc. 10 students Reading: make inferences from the story about the plot, setting and characters

53 Articles- the: usage and avoidance with names of places Speaking: sharing stories about family, village/town, childhood, etc. 10 students Comprehension passage

54 This/ that/ these and those Writing a notice- announcement Speaking: Debate

55 Unit Test V

UNIT VI **8 Hours**

UNIT VI

56 One and ones Collaborative learning- problem solving Writing short answers to questions based on reading
57 Capitalization and punctuation Controlled writing Listen to a story and respond to its main elements
58 Syntax and sentence construction- rearrange jumbled sentences Guided writing Listen to a poem and discuss its elements
59 Cloze Free writing Frame simple yet purposeful questions about a given passage
60 Unit Test VI

Total: 46 Hours

Reference(s)

1. Basic English Module, L&L Education Resources, Chennai, 2011.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
6																									0
Total																									0

Assessment Questions
Evaluation Pattern

Oral Exam / OE 50	50
Test 1 - Speaking / T1-S 10	5
Test 1 - Reading / T1-R 10	5
Test 1 - Writing / T1-W 10	5
Test 1 - Listening / T1-L 10	10
Test 2 - Speaking / T2-S 10	5
Test 2 - Reading / T2-R 10	5
Test 2 - Writing / T2-W 10	5
Test 2 - Listening / T2-L 10	10

15LE202 COMMUNICATIVE ENGLISH II 3 0 0 3

Course Objectives

- To acquire skills for using English language effectively in workplace
- To prepare students for taking BEC Vantage level examination
- To enhance the communicative ability from Intermediate to Upper Intermediate level
- To enhance the communicative ability from Intermediate to Upper Intermediate level

Programme Outcomes (POs)
Course Outcomes (COs)

1. The students will be able to: Express themselves orally while interacting with individuals or groups in formal occasions
2. Listen and comprehend business conversations
3. Read and understand business correspondences and company literature
4. The students will be able to use language structures and vocabulary that is required at CEFR B2 level
5. Communicate effectively through formal and informal written business correspondences

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		1												
3		2												
4		2												
5		1												

UNIT I **9 Hours**

UNIT I: GRAMMAR AND VOCABULARY

Simple, Compound and Complex sentences - Direct and Indirect speech - Conditionals -Business vocabulary - Collocations - Discourse markers

UNIT II **9 Hours**

UNIT II: LISTENING

Listening to specific information - short notes - Listening to identify topic, content, function - Sentence stress - Rhythm - Intonation

UNIT III **9 Hours**

UNIT III: READING

Reading graphs and charts - Skimming and scanning texts - Gap Filling - Read business articles for specific information - Understanding the structure of a text - Error identification

UNIT IV **9 Hours**

UNIT IV: WRITING

Formal and Informal English - Business Correspondence, Short Documents: e-mail, memo, message, - Longer Documents: Reports and Proposals - Transcoding

UNIT V **9 Hours**

UNIT V:SPEAKING

Collaborative task - Turn taking (initiating and responding appropriately) - Negotiating - Exchanging information - Language Functions: suggesting - comparing and contrasting -expressing - Finding out facts, attitudes and opinions - Commonly mispronounced words

FOR FURTHER READING

Newspaper and Magazine reading (The Hindu / The New Indian Express / Times of India, India Today / ReadersÃ¢?? Digest) - Reading Novels (The Monk Who Sold His Ferrari by Robin Sharma; Three Mistakes by Chetan Bhagat; The Fountain head by Ayn Rand)

Total: 45 Hours

Reference(s)

1. 1.Guy Book- Hart, BEC Vantage Cambridge Business Benchmark, Upper-Intermediate Cambridge University Press, 2006.
2. 2.Eric H. Glendinning and Beverly Holmstrom, Study Reading: A Course in Reading for Academic Purposes. United Kingdom: Cambridge University Press, 2004.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Oral Exam / OE 50	50
Test 1 - Speaking / T1-S 10	5
Test 1 - Reading / T1-R 10	5
Test 1 - Writing / T1-W 10	5
Test 1 - Listening / T1-L 10	10
Test 2 - Speaking / T2-S 10	5
Test 2 - Reading / T2-R 10	5
Test 2 - Writing / T2-W 10	5
Test 2 - Listening / T2-L 10	10

15LF203 FRENCH 3 0 0 3

Course Objectives

- To help students acquire familiarity in the French alphabet & basic vocabulary
- To teach the students to use French in simple day-to-day conversations
- To prepare the students for French examination (level A1)

Programme Outcomes (POs)
Course Outcomes (COs)

1. Listen and comprehend individual sounds of French and simple day-to-day conversations.
2. Apply basic sounds and words in simple sentences for communication
3. Read and understand short passages on familiar topics.
4. Frame basic sentence structures while writing.
5. Recognize and apply basic grammar and appropriate vocabulary in completing language tasks.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		2												
3		1												
4		2												
5		1												

UNIT I **6 Hours**

UNIT 1

Alphabet FranÃƒÂ§ais et Les Accents FranÃƒÂ§ais - Les articles dÃƒÂ©finis, indÃƒÂ©finis Genre - Singulier et pluriel - Salutations

UNIT II **8 Hours**

UNIT II

Verbes - Conjugaison : PrÃƒÂ©sent (Avoir / Ãƒ?tre / ER, IR, RE : RÃƒÂ©gulier et IrrÃƒÂ©gulier) - Adjectifs - NationalitÃƒÂ©s - Professions - Formuler les questions LIRE

UNIT III **10 Hours**

UNIT 3

Moyens de transport (Transport) - Noms de Professions (Professions) - Noms d'endroits communs (Places) - NationalitÃ©s (Nationalities)ECOUTER : (Listening) Ã‰couter l- alphabet associÃ©Ã des prÃ©noms franÃ§ais - Ã‰couter et rÃ©pondre PARLER (Speaking)PrÃ©sntation - mÃªme /PrÃ©sentez- Vous (Introducingoneself)LIRE :Lireles phrases simples

UNIT IV **12 Hours**

UNIT 4

Pronoms (Pronouns) - Noms communs masculins et de femme (Common masculine and Femininenouns) - Verbes communs (Common verbs)COUTER :couter et crier les prnoms - Observer

les dessins et couter les dialogues LIRE : Lire les profils d'utilisateurs d'interlingua (alter ego)PARLER :Parler de sa ville - Parler de sa profession

UNIT V **11 Hours**

UNIT 5

Narration de son nom et l'endroit oÃ¹ on vit - Son Ã¢ge et date de naissance - NumÃ©ro de tÃ©lÃ©phone et'dresse - Narration du temps - La France en Europe PARLER :Conversation entre deux amis - Jouer la scÃ¨ne Ã‰COUTER :Ecouter les conversations (CD alter ego)Ã‰CRIRE :Ã‰crireune carte postale

Total: 47 Hours

Reference(s)

1. Grammaire Progressive du FranÃƒÂ§ais, CLÃƒ? International, 2010.
2. Collins Easy Learning French Verbs & Practice, Harper Collins, 2012
3. BarronÃƒÂ¢'s Learn French, 3rd Edition, Elizabeth Bourquin, Language Institute, 2012
4. Cours de Langue et de Civilisation FranÃƒ?Ã‚Â§aises, G. Mauger, Hachette, 2014
5. Saison 1, Marie-Noelle Cocton et al, Didier, 2014
6. FranÃƒÂ§ais Linguaphone, Linguaphone Institute Ltd., London, 2000. FranÃƒÂ§ais Harrisonburg: The Rosetta Stone: Fairfield Language Technologies, 2001.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Oral Exam / OE 50	50
Test 1 - Speaking / T1-S 10	5
Test 1 - Reading / T1-R 10	5
Test 1 - Writing / T1-W 10	5
Test 1 - Listening / T1-L 10	10
Test 2 - Speaking / T2-S 10	5
Test 2 - Reading / T2-R 10	5
Test 2 - Writing / T2-W 10	5
Test 2 - Listening / T2-L 10	10

15LG203 GERMAN 3 0 0 3

Course Objectives

- To help students acquire the basics of German language.
- To teach them how to converse in German in day-to-day situations.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Listen and identify individual sounds of German and simple day-to-day conversations.
2. Speak simple sentences using basic sounds and words.
3. Read and understand short passages on familiar topics.
4. Apply basic sentence structures while writing.
5. Apply basic grammar and appropriate vocabulary in completing language tasks.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		2												
3		1												
4		2												
5		1												

UNIT I **6 Hours**

UNIT I

Introduction to German language: Alphabets - Numbers -Greetings - country - nationalities - Working with Dictionary.

UNIT II **6 Hours**

UNIT II

Nouns - Pronouns - definite and indefinite article - Speaking about oneself - Listening to CD supplied with the books, paying special attention to pronunciation.

UNIT III **11 Hours**

UNIT III

Regular verbs - Conjugation - Irregular verbs - Time - Negation - adjectives - family - profession - Introduction to types of sentences.

UNIT IV **12 Hours**

UNIT IV

Question words - Types of Questions - Nominative - Accusative and dative case - framing basic questions and answers -Writing short notes and letter- reading the news boards, directions.

UNIT V **10 Hours**

UNIT V

Imperative case - Possessive articles - propositions - modal auxiliaries - Basic dialogue and group conversation -ordering in restaurants.

Total: 45 Hours

Reference(s)

1. Continuum International Publishing Group Ltd. London / New York, 1992. Eckhard, Christine. Whittle, Black & Ruth. Cassel Language Guides - German.
2. Rusch, Paul. Netzwerk A1. Deutsch AlsFremdsprache. Goyal Publishers & Distributers Pvt. Ltd. New Delhi, 2015.
3. Langenscheidt Universal German Dictionary: German-English, English-German. Goyal Publishers & Distributers Pvt. Ltd., New Delhi, 2009.
4. Grundkurs Deutsch A Short Modern German Grammar Workbook and Glossary. Verlag Fur Deutsch.Munichen, 2007.
5. Grundkurs. Deutsch Lehrbuch. Hueber. Munichen, 2007.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Oral Exam / OE 50	50
Test 1 - Speaking / T1-S 10	5
Test 1 - Reading / T1-R 10	5
Test 1 - Writing / T1-W 10	5
Test 1 - Listening / T1-L 10	10
Test 2 - Speaking / T2-S 10	5
Test 2 - Reading / T2-R 10	5
Test 2 - Writing / T2-W 10	5
Test 2 - Listening / T2-L 10	10

15LC203 CHINESE 3 0 0 3

Course Objectives

- To help students acquire the basics of Chinese language.
- To teach the student show to converse in Chinese in various situations.
- To teach Chinese cultural facets and social etiquettes to the students.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Identify Initials and Finals of Chinese Alphabet.
2. Recognise four different tones in a spoken Chinese sentence.
3. Read Mandarin Chinese through Pinyin.
4. Form sentences using basic Chinese vocabulary.
5. Listen and understand basic Chinese conversation

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	2	1												
3		1												
4	2	1												
5		2												

UNIT I **9 Hours**

NÇ?HÇ?O-Ä½ Å¥½
XuÃ©huÃ¬wÃ¨nhÃ²u de jÄ«bÄ?nbiÇ?odÃ¡yÃ²ngyÇ? - å¦ä¼?é?®å??ç??å?ºæ?¬è¡¨è¾¾ç?¨è¯ ; XuÃ©huÃ¬jiÃ¨shÃ ozÃ¬jÇ? de xÃ¬ngmÃng, guÃ³jÃ - å¦ä¼?ä»?ç»?è?ªå·±ç??å§?å??ï¼?å?½é?? ; XuÃ©huÃ¬hÃ nyÇ?pÄ«nyÄ«n de shÃ¨ngmÇ? - å¦ä¼?æ±?è¯æ?¼é?³ç??å?£æ¯? ; yÃ¹nmÇ?hÃ©shÄ?ngdiÃ o - é?µæ¯?å??å£°è°? ; PÄ«ndÃºhÃ©shÄ?ngdiÃ oliÃ nxÃ - æ?¼è¯»å??å£°è°?ç»?ä¹

UNIT II **9 Hours**

UNIT 2
Xiànzàij?di?n-????
Xuéhuìshíji?n, rìqí de bi?odá - ?????????? ; Rèsh?n - ?? ; Sh?ngcí - ?? ; Jùzi - ?? ; Huìhuà - ?? ;Huódòng - ?? ; Kàntúwánchénghuìhuà - ?????? ; Xuécíy?shu?shíji?n ; Tìhuànliànxí - ????Dúy?dúránhòuliánxiàn - ??????? ; B?xiàmiàn de cíànzhèngquè de shùnxùpáilièchéngjù - ??????????????

UNIT III **9 Hours**

UNIT 3
Nàjiànmáoy?z?nmemài? - ??????? ?
Xúnwènjiàqiánjíqián de bi?odá - ????????? ; T?ojiàhuánjià - ???? ; Tích?duìsu?m?id?ngx?dàxi?o, yánsèd?ngd?ngjùt?y?oqiú - ?????????????????? ; Sh?ngcíHuódòng - ?? ; Kàntúwánchénghuìhuà - ?????? ; Xuécíy?shu?shíji?n ;Dúy?dúránhòuliánxiàn - ??????? ;T?nglùy?nxu?nzézhèngquèdá'àn - ????????? ; B?ch?ngcíy?bi?o - ?????

UNIT IV **9 Hours**

UNIT 4

Xuéhuìxúnwènji?tíngqíngkuàng, zhíyèhéniánlíng - ?????????????? Xuéhuìdi?ncàitíy?oqiújiézhàng - ????????? ; Sh?ngcí - ?? ; Jùzi - ?? ; Huìhuà - ?? ;Huódòng - ?? ; Kàntúwánchénghuìhuà - ?????? ; Xuécíy?shu?shíji?n ;Dúy?dúránhòuliánxiàn - ??????? ;T?nglùy?nxu?nzézhèngquèdá'àn - ????????? ; B?ch?ngcíy?bi?o - ?????Juésèbàny?n - ???? ; T?nglùy?npànduànduìcuò - ???????

UNIT V **9 Hours**

UNIT 5

N?zàin?'erg?ngzuò -?????

Xuéhuìxúnwènji?tíngqíngkuàng, zhíyèhéniánlíng - ??????????????Sh?ngcí - ?? ; Jùzi - ?? ; Huìhuà - ?? ; Huódòng - ?? ; Kàntúwánchénghuìhuà - ?????? ;T?nglùy?nxu?nzézhèngquèdá'àn - ????????? ; B?ch?ngcíy?bi?o - ????? - T?nglùy?nxu?nzézhèngquèdá'àn - ????????? ; B?ch?ngcíy?bi?o - ?????

Total: 45 Hours

Reference(s)

1. David J. White. My Chinese Classroom, 2005
2. Tiyan Hanyu Shenghuo Pian, Experiencing Chinese, Ying Yu Ban Di 1 Ban. Beijing: Higher Education Press: Gaodengjiaohuchu ban she. 2011
3. Hancel, Don. Mandarine Day. Chinese learning Software
4. www.chinesexp.com.cn www.yiwen.com.cn

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
																							Total		0

Assessment Questions

Evaluation Pattern

Oral Exam / OE 50	50
Test 1 - Speaking / T1-S 10	5
Test 1 - Reading / T1-R 10	5
Test 1 - Writing / T1-W 10	5
Test 1 - Listening / T1-L 10	10
Test 2 - Speaking / T2-S 10	5
Test 2 - Reading / T2-R 10	5
Test 2 - Writing / T2-W 10	5
Test 2 - Listening / T2-L 10	10

15LH203 HINDI 3 0 0 3

Course Objectives

- To help students acquire the basics of Hindi language
- To teach them how to converse in Hindi in day-to-day situations
- To help students acquire the ability to understand a simple technical text in Hindi

Programme Outcomes (POs)
Course Outcomes (COs)

1. Read and identify Hindi letters, words and simple sentences.
2. Construct simple sentences and use appropriate vocabulary during day-to-day oral communication.
3. Identify basic sounds of Hindi language and understand simple conversations on familiar topics.
4. Write common words and sentences.
5. Comprehend elementary level grammar of Hindi.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	2	1												
3	1													
4	2													
5	2													

UNIT I **9 Hours**

HINDI ALPHABET

Introduction - Vowels - Consonants - Plosives - Fricatives - Nasal sounds - Vowel Signs - Chandra Bindu & Visarg -Table of Alphabet -Vocabulary.

UNIT II **9 Hours**

NOUNS IN HINDI

Genders (Masculine & Feminine Nouns ending in a ,e,i,o, u,)- Masculine & Feminine - Reading Exercises.

UNIT III **9 Hours**

PRONOUNS AND TENSES

Categories of Pronouns - Personal Pronouns - Second person (you & honorific) - Definite & Indefinite pronouns - Relative pronouns - Present tense - Past tense - Future tense -Assertive & Negative Sentences - Interrogative Sentences.

UNIT IV **9 Hours**

CLASSIFIED VOCABULARY

Parts of body - Relatives - Spices- Eatables- Fruit & Vegetables - Clothes - Directions-Seasons - Professions.

UNIT V **9 Hours**

SPEAKING

Model Sentences - Speaking practice for various occasions.

Total: 45 Hours

Text Book(s)

1. B. R. Kishore, Self Hindi Teacher for Non-Hindi Speaking People, Vee Kumar Publications (P) Ltd., New Delhi, 2009.

Reference(s)

1. Syed, PrayojanMulak Hindi, RahamathullahVaniPrakasan, New Delhi, 2002.
2. Ramdev, VyakaranPradeep, SaraswathiPrakasan, Varanasi, 2004.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Oral Exam / OE 50	50
Test 1 - Speaking / T1-S 10	5
Test 1 - Reading / T1-R 10	5
Test 1 - Writing / T1-W 10	5
Test 1 - Listening / T1-L 10	10
Test 2 - Speaking / T2-S 10	5
Test 2 - Reading / T2-R 10	5
Test 2 - Writing / T2-W 10	5
Test 2 - Listening / T2-L 10	10

15LJ203 JAPANESE 3 0 0 3

Course Objectives

- To help students learn Japanese alphabet.
- To teach students how to use the basic Japanese sentences in day-to-day conversation.
- To make students familiar with the Japanese cultural facets and social etiquettes.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Recognise and write Japanese alphabet.
2. Speak using basic sounds of the Japanese language.
3. Apply appropriate vocabulary needed for simple conversation in Japanese language.
4. Apply appropriate grammar to write and speak in Japanese language.
5. Comprehend the conversation and give correct meaning.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		2												
3	1													
4	1													
5	2													

UNIT I **9 Hours**

UNIT 1

Introduction to Japanese - Japanese script - Pronunciation of Japanese(Hiragana) - Long vowels - Pronunciation of in,tsu,ga - Letters combined with ya,yu,yo - Daily Greetings and Expressions - Numerals. N1 wa N2 des - N1 wa N2 ja arimasen - S ka - N1mo - N1 no N2 - .san - Kanji - Technical Japanese Vocabulary (25 Numbers) - Phonetic and semantic resemblances between Tamil and Japanese.

UNIT II **9 Hours**

UNIT 2

Introduction - Kore - Sore - are - Kono N1 - Sono N1 - ano N1 - so des - so ja arimasen - S1 ka - S2 ka - N1 no N1 - so des ka ' koko - soko - asoko - kochira - sochira - achira - N1 wa N2 (Place) des - dhoko-N1 no N2 - Kanji-10 - ima-.ji-fun des - Introduction of verb - V mas - V masen - V mashitha - V masen deshitha - N1(Time) ne V - N1 kara N2 des - N1 tho N2 / S ne Kanji-10 - Technical Japanese Vocabulary (25 Numbers) - Dictionary Usage.

UNIT III **9 Hours**

UNIT 3

- N1(Place) ye ikimas - ki mas - kayerimasu - Dhoko ye mo ikimasen - ikimasendheshitha - N1(vehicle) de ikimasu - kimasu - kayerimasu - N1(Personal or Animal) tho V ithsu - S yo. - N1 wo V (Transitive) - N1 wo shimus - Nani wo shimasu ka - Nan & Nani - N1(Place) de V - V masen ka - V masho - Oo. Kanji-10 , N1(tool - means) de V - Word / Sentence wa go nan des ka - N1(Person)

ne agemus - N1(Person) ne moraimus - mo V shimashitha - , Kanji-10 - Japanese Typewriting using JWPCE Software, Technical Japanese Vocabulary (25 Numbers).

UNIT IV **9 Hours**

UNIT 4

Introduction to Adjectives - N1wanaadj des. N1 wa ii adj des - naadjna N1 - ii adj ii N1 - Thothemo - amari - N1 wadho des ka - N1 wadhonna N2 des ka - S1 ka S2 - dhore - N1 gaarimasu - wakarimasu - N1 ga suki masu - N1 gakiraimasu - jozu des - hetha des - dhonna N1 - Usages of yoku - dhaithai - thakusan - sukoshi - amari - zenzen - S1 kara S2 - dhoshithe, N1 gaarimasu - imasu - N1(Place) ne N2 gaarimasu - iimasu - N1 wa N2(Place) ne arimasu - iimasu - N1(Person,Place,or Thing) no N2 (Position) - N1 ya N2, Kanji-10 - Japanese Dictionary usage using JWPCE Software, Technical Japanese Vocabulary (25 Numbers).

UNIT V **9 Hours**

UNIT 5

Saying Numbers , Counter Suffixes , Usages of Quantifiers -Interrogatives - Dhonokurai - gurai - Quantifier-(Period) ne -.kai V - Quantifier dhake / N1 dhake Kanji - Past tense of Noun sentences and na Adjective sentences - Past tense of ii-adj sentences - N1 wa N2 yoriadj des - N1 tho N2 tho Dhochiragaadj des ka and its answering method - N1 [no naka] de {nani/dhoko/dhare/ithsu} ga ichiban adj des ka - answering -N1 gahoshi des - V1 mas form dhake mas - N1 (Place) ye V masu form ne ikimasu/kimasu/kayerimasu - N1 ne V/N1 wo V - Dhokoka - Nanika - gojumo - Technical Japanese Vocabulary (25 Numbers)

Total: 45 Hours

Text Book(s)

1. Japanese for Everyone: Elementary Main Textbook1-1, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.
2. Japanese for Everyone: Elementary Main Textbook 1-2, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.

Reference(s)

1. Software 1. Nihongo Shogo-1 2. Nihongo Shogo-2 3. JWPCE Software 3. JWPCE Software
2. 1. www.japaneselifestyle.com 2. www.learn-japanese.info/ 3. www.kanjisite.com/ 4. www.learn-hiragana-katakana.com/typing-hiragana-characters/

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions
Evaluation Pattern

Oral Exam / OE 50	50
Test 1 - Speaking / T1-S 10	5
Test 1 - Reading / T1-R 10	5
Test 1 - Writing / T1-W 10	5
Test 1 - Listening / T1-L 10	10
Test 2 - Speaking / T2-S 10	5
Test 2 - Reading / T2-R 10	5
Test 2 - Writing / T2-W 10	5
Test 2 - Listening / T2-L 10	10

15PH201 PHYSICS OF MATERIALS 3 0 2 4

Course Objectives

- To understand the physical properties of conductors, semiconductors and superconductors
- To recognize the basic principles of interaction of light with matter and working of optical devices
- To classify the types of dielectric, magnetic materials and polarization mechanisms with their properties

Programme Outcomes (POs)
Course Outcomes (COs)

1. Analyze the properties of conductors and superconductors for different applications
2. Apply the concepts and types of semiconductors for solar cell applications
3. Discuss the types, properties and applications of dielectric materials
4. Explain the properties of optical materials, working mechanism of LEDs and LCDs
5. Classify the magnetic materials with their properties and apply in the data storage devices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		2	3			3								
3	1	2												
4		2												
5		1												

UNIT I **9 Hours**

CONDUCTING AND SUPERCONDUCTING MATERIALS

Electrical and thermal conductivity of metals - Wiedemann Franz law - band theory of metals - density of states. Superconductors: properties - types - High Tc superconductors- applications.

UNIT II **10 Hours**

SEMICONDUCTORS

Elemental and compound semiconductors - intrinsic semiconductors: carrier concentration - electrical conductivity- band gap. Extrinsic semiconductors: carrier concentration - variation of Fermi level. Hall effect: theory and experimental determination -applications:Solar cells

UNIT III **9 Hours**

DIELECTRIC MATERIALS

Types of polarization: electronic, ionic, orientation and space charge polarization mechanisms - Langevin-Debye equation - frequency and temperature effects on polarization - dielectric strength and loss -dielectric breakdown mechanisms - active dielectric materials: pizo, pyro and ferroelectricity - applications.

UNIT IV **9 Hours**

OPTICAL MATERIALS

Interaction of light with materials - optical absorption - transmission - Luminescence in solids - Fluorescence and Phosphorescence - Optical band gap - LED ,LCD.

UNIT V **8 Hours**

MAGNETIC MATERIALS

Classification and properties - domain theory - hard and soft magnetic materials - anti-ferro and ferri magnetic materials - applications: magnetic recording and memories.

FOR FURTHER READING

Photonic crystals - LIFI

1 **2 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 1

Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

3 **4 Hours**

EXPERIMENT 2

Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

4 **4 Hours**

EXPERIMENT 3

With the aid of travelling microscope, find the refractive index of a transparent solid and liquid material.

5 **4 Hours**

EXPERIMENT 4

Determine the wavelength of polychromatic source in the visible region using spectrometer.

6 **4 Hours**

EXPERIMENT 5

Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

7 **4 Hours**

EXPERIMENT 6

Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

8 **4 Hours**

EXPERIMENT 7

Determine the V-I characteristics of a solar cell.

Total: 75 Hours

Reference(s)

1. Saxena, Gupta, Saxena, Mandal, Solid State Physics, Pragati Prakashan Educational Publishers, 13th revised edition, Meerut, India, 2013.
2. M.N. Avadhanulu and P.G. Kshirsagar, A Text Book of Engineering Physics, S. Chand & Company Ltd., New Delhi, 2011.
3. S. O. Pillai, Solid State Physics, New Age International Publications, New Delhi, 2010.
4. M.A. Wahab, N.K. Mehta, Solid state physics-structure and properties of materials, Narosa publishing house Pvt. Ltd, 6th edition, 2010.
5. Semiconductor Physics and Devices, Donald A. Neamen , Mc Graw-Hill, 2011.
6. P.K. Palanisamy, Materials Science, Scitech Publications India Pvt. Ltd, 2014.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	4	2		1	4	2		1	2			1	1											20
2	2		2		2		4		5	3			4												22
3	1	2	1		3	4			3	4			2												20
4	2	2			2	5			2	5			2												20
5	1	3			3	2	3		3	1			2												18
Total																									100

Assessment Questions

Remember

1. State Meissner effect
2. List six properties of superconducting materials
3. Define photovoltaic effect
4. List the six common applications of dielectric materials
5. Retrieve optical absorption in metals
6. Reproduce the principle of LCD in display devices
7. Recall the term hysteresis in ferromagnetic materials
8. List four applications of magnetic materials
9. Recognize the need of optical band gap in differentiating the materials
10. Reproduce five applications of hard magnetic materials in day to day life

Understand

1. Explain the principle, construction and working of LED
2. Classify the three types of materials based on band gap energy
3. Interpret the working mechanism and characteristics of a solar cell
4. Illustrate Hall effect experiment used to find the concentration of charge carriers in n- type semiconductors and hence explain the necessary theory
5. Summarize the various dielectric breakdown mechanisms observed in dielectric materials
6. Infer the principle involved in working of magnetic levitation
7. Classify the two types of luminescence in solids with appropriate energy level diagrams
8. Subsume the four types of polarization mechanisms involved in dielectric materials
9. Illustrate the V-I characteristics of a solar cell
10. Extrapolate the Clausius Mosotti equation for the dielectric material which is subjected to external electric field

Apply

1. Free electron density of aluminum is 18.10x1028 m-3. Calculate its Fermi energy at 0K. Planck’s constant and mass of free electron are 6.62x10-34 Js and 9.1x10-31 Kg

2. Compute the relation between Remanence and Coercivity
3. Demonstrate the domain theory of ferromagnetism
4. Derive the expressions for electrical and thermal conductivity of metals and hence compute the Wiedemann Frantz law
5. Compute the carrier concentration in intrinsic and extrinsic semiconductors
6. Calculate the number of free electrons per unit volume in a metal in terms of Fermi energy
7. Assess the Magnetic levitation and SQUIDS in day to day life
8. Show the importance of dielectric breakdown mechanisms in dielectrics
9. Implement the applications of dielectric materials in real world problems
10. Compute the relation between polarization vector (P) and electric field (E)

Analyse

1. Differentiate Phosphorescence and Fluorescence
2. Can we increase the orientation polarization with increase in temperature? Justify
3. Justify the principle, construction, working, advantages and disadvantages of LCD
4. Compare hard and soft magnetic materials
5. Differentiate the ferromagnetic and anti-ferromagnetic materials with examples
6. Compare dia, para and ferromagnetic materials
7. Distinguish between polarization and polarizability
8. Differentiate elemental and compound semiconductors
9. Compare type I and type II superconductors
10. Compare LED and LCD

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15PH202 APPLIED PHYSICS 3 0 2 4

Course Objectives

- To understand conducting, semiconducting, dielectric and magnetic properties of materials and exemplify their applications
- To analyze the basic concepts of thermodynamics and heat transfer with illustrations
- To gain knowledge about acoustical standards of buildings

Programme Outcomes (POs)
Course Outcomes (COs)

1. Analyze the physical properties of conducting and semiconducting materials
2. Discuss the physical properties of dielectric and magnetic materials with their applications
3. Apply the thermodynamic processes and laws to compute the efficiency of heat engines
4. Compare the different heat transfer modes with real time applications of conduction
5. Explain the characteristics of music and select proper sound absorbing materials for good acoustic of buildings

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	1	2	3											
3	1	2												
4		2												
5	2													

UNIT I **11 Hours**

CONDUCTORS AND SEMICONDUCTORS

Conductors: Classical free electron theory - electrical and thermal conductivity- Wiedemann - Franz law - merits and demerits of classical free electron theory - band theory - density of states. Semiconductors: Elemental and compound semiconductors - intrinsic semiconductors -Fermi level and electrical conductivity - band gap energy - extrinsic semiconductors - n-type and p-type semiconductors: variation of Fermi level with temperature (qualitative) - Hall effect - applications.

UNIT II **9 Hours**

DIELECTRIC AND MAGNETIC MATERIALS

Dielectrics: Fundamental terminologies - electronic and ionic polarizations - orientation polarization mechanism (qualitative) - space charge polarization - Langevin -Debye equation - dielectric loss - applications of dielectric and insulating materials.
Magnetic Materials: Properties of dia, para and ferromagnetic materials - domain theory of ferromagnetism - hysteresis curve - hard and soft magnetic materials - applications

UNIT III **9 Hours**

THERMODYNAMICS

Zeroth law of thermodynamics - Heat - equilibrium and quasistatic process - path functions - comparison between heat and work - internal energy - first law of thermodynamics - isothermal and adiabatic process - work done - reversible and irreversible process - second law of thermodynamics -

entropy - enthalpy - Carnot ideal engine and its efficiency - Carnot's theorem-actual heat engine: Diesel engine and its efficiency

UNIT IV **9 Hours**

HEAT TRANSFER

Modes of heat transfer - thermal conductivity - heat capacity and diffusivity - rectilinear flow of heat - conduction through bodies in series and parallel - determination of thermal conductivity: good conductor: Searle's method - bad conductor: Lee's disc method - applications of heat transfer: formation of ice in ponds - conductivity of earth's crust and age of earth - practical applications

UNIT V **7 Hours**

ACOUSTICS

Classification of sound based on frequency - characteristics of audible sound - reverberation time: Sabine's formula - determination of absorption coefficient - Erying's formula (qualitative). Sound insulation - sound absorbing materials - factors affecting the acoustics of building - remedies

FOR FURTHER READING

Nanomaterials and its applications

1 **2 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 1

Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

3 **4 Hours**

EXPERIMENT 2

Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

4 **4 Hours**

EXPERIMENT 3

With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material

5 **4 Hours**

EXPERIMENT 4

Determine the wavelength of polychromatic source in the visible region using spectrometer

6 **4 Hours**

EXPERIMENT 5

Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

7 **4 Hours**

EXPERIMENT 6

Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

8 **4 Hours**

EXPERIMENT 7

Determine the V-I characteristics of a solar cell.

Total: 75 Hours

Reference(s)

1. William D. Callister, Materials Science and Engineering an Introduction, John Wiley and Sons,Inc, 2010
2. BrijLal, N. Subrahmanyam and P. S. Hemne, Heat, Thermodynamics & Statistical Physics, S. Chand & Company Ltd., New Delhi, 2012
3. Saxena, Gupta, Saxena, Mandal, Solid State Physics, Pragati Prakashan Educational Publishers, 13threvised edition, Meerut, India, 2013
4. P.K. Mittal, Applied Physics, I.K. International Publishing House Pvt. Ltd, 2008
5. Donald A. Neamen, Semiconductor Physics and Devices,McGraw-Hill, 2011

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	3	4				3				4	4			2					4						24
2	2	2				4	2			2	4			4											20
3	2	4				4	2			4	2			2											20
4	2	2				4	2			2	4			4											20
5	2	2				2	2			4					4										16
Total																									100

Assessment Questions

Remember

1. State Ohm's law.
2. Define drift velocity.
3. List the two drawbacks of classical free electron theory.
4. State Wiedemann-Franz law.
5. Mention the practical unit used for electron's magnetic moment.
6. Recall the term hysteresis in ferromagnetic materials.
7. List the four uses of magnetic materials.
8. State Zeroth law of thermodynamics.
9. State the Kelvin's statement of second law of thermodynamics.
10. Name the three modes of heat transfer.
11. State Echelon effect.

Understand

1. Illustrate the significance of Fermi energy.
2. Why indirect gap semiconductors are preferred in fabricating transistors?
3. Classify the types of magnetic materials.
4. Outline the term retentivity and coercivity.
5. Compare dia, para and ferro magnetic materials.
6. Point out the ideal conditions required for diesel cycle.
7. Sketch the isothermal and adiabatic processes in P-V diagram.
8. Is it possible for a practical engine to have 100% efficiency? Justify.
9. Ice kept in saw dust or wrapper in a blanket will not melt. Why?
10. Classify the types of sound waves.
11. Explain the three characteristics of musical sound.

Apply

1. The average energy of a conduction electron in copper at 300 K is 4.23 eV. Calculate the Fermi energy of copper at 300 K.
2. Determine the carrier concentration of *p*-type semiconductor whose hall coefficient is 3.6610-4 m3/C.
3. Compute the efficiency of Carnot's engine operating between the temperatures 3270C and 270C.
4. Point out practical applications of heat conduction.
5. Compute the efficiency of Carnot's engine working the steam point and the ice point.
6. Assess the reason for the formation ice on pond surface.
7. The intensity of sound produced by thunder is 0.1 Wm-2.Calculate the intensity level in decibels.
8. Calculate Sabine's mathematical relation for reverberation time of the hall.
9. Compute the minimum wavelength of audible sound at zero degree centigrade.

Analyse

1. Distinguish between relaxation time and collision time.
2. Differentiate between electrical and thermal conductivity.
3. List the various applications of soft and hard magnetic materials for day to day life.
4. Analysis the six properties of hard and soft magnetic materials.
5. If the system and surrounding are in thermal equilibrium, is it necessary they are in same state? Comment the statement.
6. Differentiate isothermal and adiabatic process.
7. Entropy remains constant in an adiabatic process. Justify the statement.
8. Compare Carnot's cycle and diesel cycle.
9. Distinguish between loudness and intensity of sound.
10. Compare reverberation and echo.
11. How do you maintain optimum reverberation in a hall? Justify.

Evaluate

1. The mean free collision time of copper at 300 K is equal to 2X 10^{-14} s. Determine its electrical conductivity.
2. A silicon plate of thickness 1mm, breadth 10 mm and length 100mm is placed in a magnetic field of 0.5 wb/m^2 acting perpendicular to its thickness. If 10^{-2} A current flows along its length, determine the Hall voltage developed if the Hall coefficient is 3.66 X 10^{-4} m^3 / Coulomb

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15PH203 MATERIALS SCIENCE 3 0 2 4

Course Objectives

- To explain the properties of conducting, semiconducting and dielectric materials
- To impart fundamental knowledge in optical materials
- To understand the nature and applications of different magnetic materials

Programme Outcomes (POs)
Course Outcomes (COs)

1. distinguish electrical properties of different kinds of conducting materials
2. identify the different types of semiconductors and its applications
3. categorize the various polarization mechanisms in dielectrics
4. choose the suitable material for the construction of display devices
5. select appropriate magnetic materials for magnetic storage devices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	1	2												
3	2	1	1											
4	1	2	2											
5	1	2												

UNIT I **8 Hours**

ELECTRICAL PROPERTIES OF METALS

Quantum free electron theory: Fermi-Dirac distribution function - Fermi energy and its variation with temperature - density of energy states - calculation of density of electrons and fermi energy at 0K - mean energy of electrons at 0K - problems.

UNIT II **10 Hours**

SEMICONDUCTING MATERIALS

Introduction - elemental and compound semiconductors - intrinsic semiconductors: expressions for number of electrons and holes - determination of carrier concentration and position of Fermi energy - electrical conductivity - band gap energy determination - carrier concentration in extrinsic semiconductors. Hall effect: theory and experimental determination - uses - problems.

UNIT III **9 Hours**

DIELECTRICS

Introduction - fundamental definitions in dielectrics - expressions for electronic and ionic polarizations - orientation polarization (qualitative) - space charge polarization - Langevin - Debye equation - frequency and temperature effects on polarization - internal field - expression for internal field (cubic structure) - Clausius-Mosotti equation and its importance - applications of dielectric materials - problems.

UNIT IV **9 Hours**

OPTICAL MATERIALS

Introduction - optical absorption in metals, semiconductors and insulators. Fluorescence and phosphorescence. Light emitting diode: principle, construction, working and applications. Liquid crystal display: general properties - dynamic scattering display - twisted nematic display - applications - comparison between LED and LCD. Blue ray disc - principle - working.

UNIT V **9 Hours**

MAGNETIC MATERIALS

Introduction - orbital and spin magnetic moments - Bohr magneton - basic definitions - classification of magnetic materials - domain theory of ferromagnetism - process of domain magnetization - explanation of hysteresis curve based on domain theory - hard and soft magnetic materials.

FOR FURTHER READING

Optical data storage and Giant magnetoresistance

1 **2 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 1

Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

3 **4 Hours**

EXPERIMENT 2

Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

4 **4 Hours**

EXPERIMENT 3

With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material.

5 **4 Hours**

EXPERIMENT 4

Determine the wavelength of polychromatic source in the visible region using spectrometer.

6 **4 Hours**

EXPERIMENT 5

Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

7 **4 Hours**

EXPERIMENT 6

Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

8 **4 Hours**

EXPERIMENT 7

Determine the V-I characteristics of a solar cell.

Total: 75 Hours

Reference(s)

1. William D. Callister, Materials Science and Engineering an Introduction, John Wiley and Sons, Inc, 2010.
2. S.O. Pillai, Solid State Physics, New Age International Publications, New Delhi, 2014.
3. M.N. Avadhanulu and P.G. Kshirsagar, A Text Book of Engineering Physics, S. Chand & Company Ltd., New Delhi, 2011.
4. P.K. Palanisamy, Physics For Engineers, Scitech Publications (India) Pvt. Ltd., Chennai, 2010.
5. V. Raghavan, Materials Science and Engineering, Prentice Hall of India, New Delhi, 2010.
6. R.K.Gaur and S.L.Gupta, Engineering Physics, Dhanpat Rai publications, New Delhi, 2010.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	5	2		1	5	2		1																18
2	2		2		2	3	2		5		2		4												22
3	1	2	1		3	3			3	5			2												20
4	2	3			3	3			2	5			2												20
5	1	3			3	2	5		3	1			2												20
Total																									100

Assessment Questions

Remember

1. Define density of electron energy states in metals.
2. Recall Fermi energy.
3. State Hall Effect.
4. List out the four advantages of semiconductors.
5. Define dielectric constant
6. Recall electric polarization.
7. Define Fluorescence.
8. Recognize hard and soft magnetic materials.
9. State the working principle of LED.
10. Define Bohr magnetron.

Understand

1. Classify three types of free electron theory
2. Represent the variation of Fermi level with temperature
3. Explain Clausius-Mosotti relation.
4. Compare element and compound type semiconductors.
5. Illustrate the variation of Fermi level with temperature in n-type semiconductors.
6. Distinguish between a dielectric and insulator.
7. Mention the technique to increase the emission time in phosphorescence.
8. Exemplify hysteresis on the basis of domain theory of ferromagnetism.
9. Identify four examples for hard magnetic materials.
10. Identify four properties of ferromagnetic materials.

Apply

1. Compute the Fermi direc function for energy kT above the Fermi energy.
2. Asses the Fermi-Dirac distribution function.

3. Energy level of p-type and n-type semiconductors and justify the results
4. Compute the carrier concentration of intrinsic semiconductors
5. Explain the principle, construction and working of Hall Effect
6. Show that electronic and ionic polarizabilities are independent of temperature.
7. Calculate the polarization of an atom above value five.
8. Differentiate the dia, para and ferromagnetic materials.
9. Compute the B-H Hysteresis curve on the basis of domain theory.

Analyse

1. Discriminate drift velocity and thermal velocity of an electron
2. Difference between p-type and n-type semiconductors.
3. Obtain the expression for concentration of charge carriers in p-type semiconductor.
4. In practical dielectrics, the current does not exactly lead the voltage by 90?. Justify.
5. Local field is the space and time average of the electric field acting on a particular molecule Justify the result.
6. Justify the special features of magnetic blue ray disks.
7. Analyze the role of energies in the domain growth.
8. Explain the roll of activators in optical materials
9. Describe the working of twisted pneumatic display device.
10. Compare LED and LCD.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15PH204 PHYSICS OF ENGINEERING MATERIALS 3 0 2 4

Course Objectives

- To familiarize with the physical properties of materials
- To gain practical applications of modern spectroscopy and microscopy techniques
- To understand the preparation of bio and nanomaterials

Programme Outcomes (POs)
Course Outcomes (COs)

1. identify the electrical and thermal properties of conducting and semiconducting materials
2. analyze the various polarization mechanisms in dielectrics
3. choose specific materials for optical and magnetic data storage devices
4. investigate the specimen with the aid of suitable spectroscopic techniques
5. realize the methods adopted for preparing nano materials

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1		1									
2		1	2		2									
3	1	2			1									
4	2	1			1	1								
5	2				2	1								

UNIT I **10 Hours**

CONDUCTING AND SEMICONDUCTING PROPERTIES

Quantum free electron theory - Fermi-Dirac distribution function - effect of temperature on Fermi function - density of energy states - calculation of density of electrons and Fermi energy at 0 K. Intrinsic semiconductors: expressions for density of electrons and holes - intrinsic carrier concentration - band gap energy. Extrinsic semiconductors: carrier concentration in n-type and p-type semiconductors - variation of Fermi level with temperature and impurity concentration - problems.

UNIT II **9 Hours**

DIELECTRIC PROPERTIES

Introduction: fundamental definitions in dielectrics - types of polarization - expressions for electronic and ionic polarization mechanisms - orientation polarization (qualitative) - Langevin-Debye equation - frequency and temperature effects on polarization - dielectric loss - dielectric breakdown mechanisms - active dielectric materials - applications of dielectric materials - problems.

UNIT III **10 Hours**

OPTICAL AND MAGNETIC PROPERTIES

Optical properties: introduction - light interaction with solids - atomic and electronic interactions - optical properties of metals, semiconductors and insulators - reflection - refraction - absorption - transmission - luminescence and photoconductivity. Magnetic properties: introduction - origin of magnetic moment - properties of dia, para and ferro magnetic materials - domain theory and hysteresis effect - hard and soft magnetic materials - problems.

UNIT IV **8 Hours**

SPECTROSCOPY AND MICROSCOPY TECHNIQUES

Introduction: different types of spectroscopy techniques - basic principle of FTIR spectroscopy and X-ray Photoelectron Spectroscopy (XPS). Basic principle and working mechanisms of Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - Atomic Force Microscope (AFM).

UNIT V **8 Hours**

BIO AND NANO MATERIALS

Biomaterials: classification of biomaterials - development of biomaterials - applications. Nanomaterials: properties - synthesis of nanomaterials - top-down approach: ball milling technique - bottom-up approach: Chemical Vapour Deposition (CVD) - uses of nanomaterials. Carbon nanotubes: properties and applications.

FOR FURTHER READING

Health and environmental impacts

1 **2 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 1

Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

3 **4 Hours**

EXPERIMENT 2

Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

4 **4 Hours**

EXPERIMENT 3

With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material.

5 **4 Hours**

EXPERIMENT 4

Determine the wavelength of polychromatic source in the visible region using spectrometer.

6 **4 Hours**

EXPERIMENT 5

Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

7 **4 Hours**

EXPERIMENT 6

Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

8 **4 Hours**

EXPERIMENT 7

Determine the V-I characteristics of a solar cell.

Total: 75 Hours

Reference(s)

1. William D. Callister, Materials Science and Engineering An Introduction, John Wiley and Sons, Inc, 2010.
2. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
3. Jacob Milliman, Christos Halkias, Satyabrata JIT, Electronic Devices and Circuits, McGraw Hill Education (India) Private Limited, New Delhi, 2014.
4. S. O. Pillai, Solid State Physics, New Age International Publications, New Delhi, 2010.
5. Subbiah Pillai, Nanobiotechnology, MJP Publishers, 2010.
6. Yang Leng, Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, Wiley-VCH, 2013.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	1	4	2		2	5	2		2	2			1	1											22
2	2		2		2		2		5	3			4												20
3	2		2		3	3	2		3	3			2	2											22
4	1	2	1		3	3			3	3			2												18
5	2	2			3	2	3		2				2	2											18
Total																									100

Assessment Questions

Remember

1. Recall the merits of quantum free electron theory over classical free electron theory
2. Define carrier concentration
3. Recall Fermi energy
4. List the four types of polarization mechanisms.
5. Recognize polar and non-polar molecules
6. Define Bohr magneton
7. Recall coercivity and retentivity
8. Point out the four salient features of biomaterials
9. Define bioactive materials
10. State the working principle of FTIR spectroscopy

Understand

1. Classify three types of materials based on bandgap energy
2. Explain fermi-distribution function and effect of temperature on Fermi function
3. Represent the variation of Fermi level with temperature
4. Explain intrinsic and thermal breakdown mechanisms
5. Infer the importance of Fermi level in a semiconductor
6. Illustrate the phenomenon of B-H hysteresis on the basis of domain theory
7. Classify four types of biomaterials
8. Represent the scanning electron microscope to determine the grain size of the nanomaterials
9. Explain the principle, construction and working of Scanning electron microscope
10. Explain the principle and working mechanism of X – ray photoelectron spectroscopy (XPS)

Apply

1. Find the variation of Fermi level with temperature and impurity concentration in n-type semiconductors
2. Show that electronic and ionic polarizabilities are independent of temperature
3. Show that the position of Fermi level is exactly at the midpoint of forbidden energy gap in intrinsic semiconductor
4. Compute the relationship between polarizability and electric flux density.
5. Assess the properties of dia, para and ferromagnetic materials
6. Show that top down method is inferior to bottom up method
7. Construct B-H Hysteresis curve on the basis of domain theory
8. Design the principle, construction and working of chemical vapour deposition.
9. Show that the electronic polarizability is directly propotional to the volume of an atom
10. Compute the expression for carrier concentration in intrinsic semiconductors

Analyse

1. Extrinsic semiconductors possess high electrical conductivity than intrinsic semiconductors. Justify
2. Silver is the best conductor of electricity. But gold is used in high-end electronic connectors. Justify.
3. Identify the role of impurity concentration in the variation of Fermi level in the case of p-type semiconductors.
4. Compare polar dielectrics with non-polar dielectrics.
5. Analyse the features of hard and soft magnetic materials.
6. Compare the six properties of dia, para and ferro magnetic materials
7. Differentiate top down approach from bottom up approach.
8. Select the four important features of TEM
9. Justify the electronic polarizability of Argon is much greater than that of Helium.
10. Intrinsic semiconductors are insulators at 0K. Justify.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15PH205 SOLID STATE PHYSICS 3 0 2 4

Course Objectives

- To explain the properties of conducting, semiconducting and dielectric materials
- To understand the working mechanism of junction diodes
- To impart knowledge in optical and magnetic materials

Programme Outcomes (POs)
Course Outcomes (COs)

1. identify different types of emission of electrons and significance of Fermi function
2. explore the carrier concentration and its variation with temperature of different semiconducting materials
3. analyze the I-V characteristics of a junction diode
4. investigate the various polarization mechanisms in dielectrics
5. select appropriate optical and magnetic materials for data storage devices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1											
2		1	2											
3	1		2											
4	1	2												
5		1												

UNIT I **10 Hours**

EMISSION PROPERTIES AND QUANTUM THEORY OF SOLIDS

Emission of electrons: types thermionic emission-principle- Richardson equation- secondary emission- principle- work function- Fermi-Dirac distribution function and its temperature dependence significance of Fermi energy- density of energy states- calculation of density of electrons and Fermi energy at 0K- average energy of electrons at 0K problems.

UNIT II **9 Hours**

SEMICONDUCTOR PHYSICS

Intrinsic semiconductors: the law of mass action - expressions for density of electrons and holes - determination of carrier concentration - band gap energy. Extrinsic semiconductors: carrier concentration in p-type and n-type semiconductors. Hall effect: theory - experimental determination of Hall voltage - applications - problems.

UNIT III **9 Hours**

JUNCTION DIODE CHARACTERISTICS

Introduction - pn junction diode - volt-ampere characteristics - diode current equation - static and dynamic resistances - space charge - diffusion capacitance - junction diode switching times. Diode circuit with DC voltage source. Applications: full wave rectifier - capacitor filters - clamper circuits.

UNIT IV **9 Hours**

DIELECTRICS

Introduction: fundamental definitions in dielectrics - expressions for electronic and ionic polarizations - orientation polarization (qualitative) - space charge polarization - Langevin Debye equation - frequency and temperature effects on polarization - expression for internal field (cubic structure) - Clausius-Mosotti equation - dielectric loss - applications of dielectrics - problems.

UNIT V **8 Hours**

OPTOELECTRONICS AND MAGNETIC MATERIALS

Principle, working and characteristics of LED and LCD - blue ray disc. Magnetic materials: basic definitions - properties of dia, para and ferro magnetic materials - explanation of hysteresis curve based on domain theory - hard and soft magnetic materials. Magnetic storage device: principle - working - giant magnetoresistance.

FOR FURTHER READING

Motion of an electron in uniform and non-uniform magnetic fields - electric and magnetic fields in a crossed configuration.

1 **2 Hours**

INTRODUCTION

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 1

Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

3 **4 Hours**

EXPERIMENT 2

Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

4 **4 Hours**

EXPERIMENT 3

With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material.

5 **4 Hours**

EXPERIMENT 4

Determine the wavelength of polychromatic source in the visible region using spectrometer.

6 **4 Hours**

EXPERIMENT 5

Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

7 **4 Hours**

EXPERIMENT 6

Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

8 **4 Hours**

EXPERIMENT 7

Determine the V-I characteristics of a solar cell.

Total: 75 Hours

Reference(s)

1. Jacob Millman, Christos Halkias and Satyabrata JIT, Electronic Devices and Circuits, McGraw Hill Education (India) Private Limited, New Delhi, 2014.
2. William D. Callister, Materials Science and Engineering an Introduction, John Wiley and sons, Inc, 2010.
3. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
4. R. S. Sedha, A textbook of Applied Electronics, S. Chand & Company Ltd., New Delhi, 2010.
5. S. O. Pillai, Solid State Physics, New Age International Publications, New Delhi, 2010
6. M. N. Avadhanulu and P.G. Kshirsagar, A Text Book of Engineering Physics, S. Chand & Company Ltd., New Delhi, 2011.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	1	2	2		2	4	2		2	5			2												22
2	2	2			2		3		2	3					6										20
3	2		1		3		2		5				2	2				3							20
4	2	2	2		2	3			2	5			2												20
5	2	2			3	2	2		2				5												18
Total																									100

Assessment Questions

Remember

1. Recall the Richardson equation.
2. Define dynamic resistance.
3. State the law of mass action.
4. Define Hall Effect.
5. List the three practical applications of p-n junction diode.
6. List the three practical applications of p-n junction diode.
7. List the four types of polarizations in dielectrics
8. Reproduce the expressions for electronic and ionic polarization.
9. State the working principle of LED.
10. Define retentivity and coercivity.

Understand

1. Explain the variation of Fermi-Dirac distribution function with temperature.
2. Indicate the importance of Fermi level.
3. Indicate the reason for preferring extrinsic semiconductors over intrinsic semiconductors.
4. Represent four applications of Hall Effect.
5. Represent the switching action of a diode.
6. Interpret the relation between polarization and polarisability in dielectrics.
7. All the dielectrics are insulators but all the insulators are not dielectrics. Illustrate with examples.
8. Interpret the relation between the dielectric constant and electric susceptibility.
9. Explain the phenomenon of electroluminescence in LED.
10. Summarize the working principle of giant magnetoresistance.

Apply

1. Find the expression for density of electrons and Fermi energy at 0 K.
2. Using the Fermi function, compute the temperature at which there is 1% probability that an electron in a solid will have energy 0.5 eV above EF of 5 eV.
3. Explain how phosphorous atoms donate electrons to the conduction band.
4. Apply the law of mass action to determine the carrier concentration of intrinsic semiconductors.
5. Construct a circuit using p-n junction diode and execute its V-I characteristics.
6. Construct a diode circuit with DC voltage source and demonstrate its working conditions.
7. Show that electronic polarizability is independent of temperature.
8. Explain frequency dependence of dielectrics with a neat sketch.
9. Apply the domain theory to the hysteresis effect observed in ferromagnetic materials.
10. Compute the wavelength of light emitted by an LED with band gap energy of 1.8 eV.

Analyse

1. The average energy of electrons at 0 K depends on Fermi level. Justify.
2. Differentiate p-type and n-type semiconductors.
3. Outline the working principle of full wave bridge rectifier.
4. At optical frequencies the total polarization is less. Justify.
5. Outline the causes for dielectric loss in dielectric materials.
6. Analyze the magnetic behavior of dia, para and ferromagnetic materials.
7. Compare the properties of LED and LCD.
8. Outline the difference between hard and soft magnetic materials.

Evaluate

1. Evaluate the resistance value using V-I characteristics of a p-n junction diode.
2. Evaluate the value of Fermi distribution function for an energy kT above the Fermi energy at that temperature and comment on the answer.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15CH201 ENGINEERING CHEMISTRY 3 0 2 4

Course Objectives

- Recall the terminologies of electrochemistry and explain the function of batteries and fuel cells with its electrochemical reactions
- understand the fundamentals of corrosion, its types and polymers with its applications
- choose appropriate instrumentation technique for interpreting analytical data

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. construct an electrochemical cell and measure its potential using selected reference electrode
2. identify the electrodes, electrolyte and cell reactions in batteries, fuel cells and infer the selection criteria for commercial battery systems with respect to commercial applications
3. Analyze the type of corrosion, factors influencing rate of corrosion on metals and identify suitable corrosion control method
4. differentiate polymers based on its source, properties and applications
5. Select suitable analytical method for the estimation of alkali and alkaline earth metals in aqueous media

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3												
2	2													
3	3	2		1										
4	2	2												
5	3	3		1										

UNIT I **10 Hours**

INTRODUCTION TO ELECTROCHEMISTRY

Types of electrodes - electrode potential - salt bridge - cell reaction - cell representation - silver-silver chloride electrode - calomel electrode - determination of single electrode potential - electrochemical series and its importance. Ion-selective electrode: glass electrode - measurement of pH using glass electrode. Concentration cells (electrode and electrolyte). Potentiometry - potentiometric titrations (redox titration). difference between electrochemical and electrolytic cells

UNIT II **9 Hours**

ENERGY STORAGE DEVICES

Batteries - characteristics of battery - types of batteries. construction, working and applications: Primary (alkaline) and secondary (lead-acid and nickel-cadmium) - Modern batteries (zinc air battery and lithium batteries) - precautions for battery maintenance. Comparison with conventional galvanic

cells. Fuel cells - Types of fuel cells: solid polymer electrolyte fuel cell - solid oxide fuel cells - microbial fuel cell. Hydrogen-oxygen fuel cell - construction, working, advantages and limitations

UNIT III **8 Hours**

CORROSION SCIENCE

Corrosion: definition - types of corrosion: chemical and electrochemical corrosion - Pilling-Bedworth ratio - types of oxide layer (stable, unstable, volatile and porous) - hydrogen evolution and oxygen absorption mechanism for electrochemical corrosion - mechanism for rusting of iron. Types of electrochemical corrosion: Galvanic corrosion - differential aeration corrosion (pitting, waterline and pipeline). Galvanic series - applications. Factors influencing corrosion: nature of metal and environment. Corrosion control methods: sacrificial anode method - impressed current cathodic protection method - electroplating - electroless plating

UNIT IV **10 Hours**

POLYMERS AND ITS PROCESSING

Advantages of polymers over metals. Monomers - polymers - polymerization - functionality - degree of polymerization - classification of polymers based on source and applications - Molecular weight determination. Types of polymerization: addition, condensation and copolymerization - mechanism of free radical polymerization. Preparation, properties and applications of thermosetting (epoxy resin and bakelite) and thermoplastics (polyvinyl chloride and polytetrafluoroethylene). Compounding of plastics - injection and extrusion moulding methods

UNIT V **8 Hours**

INSTRUMENTATION TECHNIQUES FOR CHEMICAL ANALYSIS

Beer - Lamberts law. Principle, instrumentation (block diagram only) and applications: UV-visible spectroscopy - Atomic absorption spectroscopy - Colorimetry (estimation of a transition metal) - Flame photometry (estimation of an alkali metal)

FOR FURTHER READING

Nobel prize winners in chemistry over past 5 years

1 **2 Hours**

EXPERIMENT 1

Preparation of N/10 oxalic acid and M/10 sodium carbonate solution.

2 **4 Hours**

EXPERIMENT 2

Determination of strength of hydrochloric acid present in the given solution by pH measurement.

3 **4 Hours**

EXPERIMENT 3

Determination of strength of HCl by conductometric titration.

4 **4 Hours**

EXPERIMENT 4

Conductometric titration of mixture of acids (Hydrochloric acid and acetic acid).

5 **4 Hours**

EXPERIMENT 5

Estimation of iron in the given sample by potentiometric method using saturated calomel electrode.

6 **4 Hours**

EXPERIMENT 6

Measurement of rate of corrosion on zinc/mild steel in aerated neutral/acidic/alkaline solution by weight loss method.

7 **4 Hours**

EXPERIMENT 7

Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.

8 **4 Hours**

EXPERIMENT 8

Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method.

Total: 75 Hours

Reference(s)

1. M. Munjal and S.M. Gupta, Wiley Engineering Chemistry, Second edition, Wiley India Pvt. Ltd, New Delhi, 2013.
2. A. Pahari and B.Chauhan, Engineering Chemistry, Infinity Science press LLC, New Delhi, 2010.
3. P.H. Rieger, Electrochemistry, Springer, Netherland, Second Edition (Reprint) 2012.
4. Fred W. Billmeyer JR, Textbook of polymer science, John Wiley & sons, Third edition, 2008.
5. Willard Merritt and Dean Settle, Instrumental methods of analysis, CBS publishers, Seventh edition, 2012.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	1	1	1		3	4	2			4	4				1			2							23
2	1	1	1		4	4	3		1	2				1	2										20
3	1	1	1		2	2	1			2	2			2	1			1				1			17
4	5	3	2		3	1	1		1				1	2	2		1	1							23
5	1					3					3				7			2				1			17
Total																									100

Assessment Questions

Remember

1. List any four significances of EMF series.
2. Define the term single electrode potential.
3. Recall the four advantages of H2-O2 fuel cell.
4. Define the term functionality of a monomer.
5. State Pilling-Bedworth rule.
6. Name two monomers used for the preparation of epoxy resin.
7. Label the parts and charge carried by electrodes in electrochemical and electrolytic cells.
8. List any two significances of monomer functionality.
9. State Beer - Lamberts law.
10. Define concentration cell.

Understand

1. Classify two types of polymers based on source.
2. Compare electrochemical cell and electrolytic cell with suitable diagrams.
3. Illustrate the mechanism involved in electrochemical corrosion.
4. Explain the principle and five components of UV-visible spectrophotometer.

5. Outline the mechanism for the synthesis of –(CF2-CF2)n– polymer.
6. Identify any two analytical methods to estimate sodium present in aqueous media.
7. Illustrate the injection molding process with a necessary explanation and two advantages.
8. Indicate any two importance of salt bridge in an electrochemical cell.
9. Ilustrate the route to synthesis epoxy resin from its two monomers.
10. Summarize any four advantages of polymers over metals in everyday life.

Apply

1. Calculate the single electrode potential value zinc half-cell dipped in a 0.01M ZnSO4 solution at 25°C? E° Zn/Zn 2+ = 0.763 V, R=8.314 JK -1 Mol -1 , F= 96500 Coulombs.
2. Identify two advantages of degree of polymerization.
3. Find the concentration of given solution using spectrophotometer, if %T, bath length and molar adsorption coefficient are 18, 1 cm and 6000 L/mol. cm.
4. Derive an equation for determination pH of unknown solution using glass electrode.
5. Elaborate any six applications of electrochemical series.
6. Select and explain suitable potentiometric titration to estimate the amount of ferrous ion in the given solution.
7. Discuss the construction and working of electrolyte concentration cell with suitable example.
8. Assess the significance of functionality of monomer in the properties and structure of polymer.

Analyse

1. Outline any two methods for preventing chemical and electrochemical corrosion.
2. Compare the advantages and limitations of electro and electroless plating of nickel.
3. The statement “prevention is better than cure” is not suitable for corrosion science and engineering-Justify your answer.
4. Differentiate addition and condensation polymers based on its synthesis.
5. Arrange the following polymers based on the increasing order of resistance towards chemical
   1. poly(ethylene) 2. Starch 3.Baklite 4.Teflon

Evaluate

1. Calculate the electrode potential of zinc metal if EMF of the cell is 1.10 V (Sat. Calomel electrode was used for complete cell formation.
2. Electrode potentials of A and B are E 0 A/A+ = +0.76 V and E 0 B/B+ = -0.34 V respectively. Choose the appropriate anode half-cell and cathode half-cell by giving the cell representation
3. Find out the degree of polymerization for a low density polytetrafluoroethylene with a molecular weight of 10002 amu. (Atomic weights of F=18.9; C=12)
4. The standard reduction potentials of metals Ag, Fe, Cu and Zn are +0.80v,-0.44v, +0.34v and -0.76v respectively. Arrange the metals in the increasing order of their ability to undergo corrosion.

Create

1. A ship hull in ocean is safe against corrosion under any circumstance - Give reason.
2. Derive the probable reason and possible solution for the following:
   i. Stainless steel should not be used to build ship hull.
   ii. Small anodic area results in intense corrosion.
   iii. Metal under water drop undergoes accelerated corrosion.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15CH202 APPLIED CHEMISTRY 3 0 2 4

Course Objectives

- understand the necessity of water softening processes
- aware the causes and consequences of corrosion
- acquaint the applications of alloying and phase rule in metallurgy
- recognise the fundamentals and applications of fuels
- characterize the chemical compounds using analytical techniques.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. attribute the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications.
2. Analyze the type of corrosion, factors influencing rate of corrosion on metals and corrosion control methods
3. Differentiate ferrous and non ferrous alloys based on its properties, applications and illustrate the importance of phase rule in the field of mettallurgy
4. Distinguish the three types of fuels based on calorific value for selected applications
5. Apply suitable analytical methods for the estimation of elements in aqueous media

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2		1										
2	2	3												
3	1	2												
4	2	1												
5	2	3		1										

UNIT I **10 Hours**

WATER PURIFICATION

Hardness of water - classification of hardness (temporary and permanent) - units of hardness (ppm, mg/l, degree Clark, degree French) - expression of hardness in terms of calcium carbonate equivalence - estimation of hardness by EDTA Method - Uses of water for industrial purpose - requirements of boiler feed water - disadvantages of using hard water in industrial boilers: scale, sludge, priming, foaming and caustic embrittlement. Removal of dissolved salts from hard water: internal conditioning (phosphate, carbonate, calgon and colloidal methods), external conditioning (ion exchange process, reverse osmosis, electrodialysis). Uses of water for domestic purpose - municipal water treatment (screening, aeration, coagulation, sedimentation, filtration and disinfection of water - break point chlorination).

UNIT II **8 Hours**

CORROSION SCIENCE

Corrosion - chemical and electrochemical corrosion - Pilling-Bedworth rule - mechanism (types of oxide layer, oxygen absorption - hydrogen evolution) - Galvanic series -types of electrochemical corrosion: Galvanic corrosion - differential aeration corrosion (pitting, pipeline and waterline)-Factors influencing corrosion (nature of metal and environment). Corrosion control: sacrificial anode - impressed current method.Protective coatings - paint -constituents and functions.

UNIT III **9 Hours**

ALLOYS AND PHASE RULE

Alloys: purpose of alloying - function and effects of alloying elements - properties of alloys - classification of alloys. Ferrous alloys: nichrome and stainless steel. Non-ferrous alloys: brass and bronze. Heat treatment of alloys (annealing, hardening, tempering, normalising, carburizing and nitriding).

Phase rule: phase - component - degree of freedom - phase rule - phase diagram - applications- one component system (water system). Reduced phase rule - two component system (lead and silver system).

UNIT IV **10 Hours**

FUELS

Classification - characteristics - calorific value - solid fuel - coal - types - analysis of coal (proximate and ultimate analysis) - processing of coal to coke - carbonization - types (low temperature and high temperature carbonization) - manufacture of metallurgical coke (Otto Hoffmann method). Liquid fuels - petroleum - refining of crude oil - knocking - octane number - cetane number. Liquid fuel from coal (Bergius process). Gaseous fuels - natural gas (CNG) - coal gas - producer gas - syn gas - shale gas.

UNIT V **8 Hours**

INSTRUMENTAL METHODS

Beer - Lamberts law. Principle, instrumentation (block diagram only) and applications: Ultra violet spectroscopy - Infrared spectroscopy - Atomic absorption spectroscopy - Colorimetry (estimation of transition metal) - Flame photometry (estimation of alkali metal).

FOR FURTHER READING

Synthesis and applications of bio-fuels.

1 **2 Hours**

EXPERIMENT 1

Preparation of N/10 oxalic acid and N/10 sodium carbonate solution.

2 **4 Hours**

EXPERIMENT 2

Water quality of BIT campus - River - Bore well water with respect to hardness, TDS and pH.

3 **4 Hours**

EXPERIMENT 3

Conductometric titration of mixture of acids (HCl CH3COOH).

4 **4 Hours**

EXPERIMENT 4
Determination of strength of hydrochloric acid in a given solution using pH meter.

5 **4 Hours**

EXPERIMENT 5
Determination of the strength of Fe(II) in the given sample by potentiometric method.

6 **4 Hours**

EXPERIMENT 6
Measurement of rate of corrosion on mild steel in aerated / neutral / acidic / alkaline medium by weight loss method.

7 **4 Hours**

EXPERIMENT 7
Estimation of copper content in brass by EDTA method.

8 **4 Hours**

EXPERIMENT 8
Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method.

Total: 75 Hours

Reference(s)

1. A. Pahari and B.Chauhan, Engineering Chemistry, Infinity Science press LLC, New Delhi, 2010.
2. M. Munjal and S.M. Gupta, Wiley Engineering Chemistry, Second edition, Wiley India Pvt. Ltd, New Delhi, 2013.
3. Willard Merritt and Dean Settle, Instrumental methods of analysis, CBS publishers, Seventh edition, 2012.
4. Jain and Jain, Engineering Chemistry, Dhanpat Rai Publishers New Delhi, 16th Edition, 2013.
5. R. Mukhopadhy and S. Datta, Engineering Chemistry, New age international Pvt. Ltd, New Delhi, 2010.
6. Shashi Chawla, Engineering Chemistry, Dhanpat Rai Publishers New Delhi, 2nd Edition, 2003.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	1	1	1		3	4	2			4	4				1			1				1			23
2	1	1	1		2	2	1			2	2			2	1			1				1			17
3	1	1	1		4	4	3		1	2					2							1			20
4	5	3	2		3	1	1		1				1	2	1		1	1				1			23
5	1					3					3				7			2				1			17
Total																									100

Assessment Questions
Remember

1. Define the term hardness of water.
2. List any two internal conditioning methods to convert hard water to soft water.
3. List the two types of electrochemical corrosion.

4. Recall any two reasons for galvanic corrosion.
5. List the four major objectives of alloying steel.
6. State Gibbs phase rule.
7. Define octane number.
8. State Beer-Lambert's law.
9. Recall any four applications of colorimetry.

Understand

1. Compare temporary and permanent hardness in water.
2. Illustrate the estimation of carbonate, non-carbonate and total hardness by EDTA method.
3. Identify the needs of corrosion control methods with suitable examples.
4. Indicate the two suitable conditions for electrochemical corrosion to occur.
5. Classify the three types of alloys based on metal composition.
6. For one component water system, the triple point is an invariant point. Reason out.
7. Distinguish between syn gas and coal gas.
8. With a neat diagram, explain the processes involved in Bergius process to get synthetic petrol.
9. Diiferentiate chromophore and auxochrome with an example.
10. Infer the role of ammonium thiocyanate in the colorimetric estimation of iron.

Apply

1. Illustrate the necessary steps involved in municipal water treatment.
2. Suggest a suitable laboratory method to estimate carbonate, non-carbonate and total hardness of water.
3. Sketch a suitable protection method to prevent ship's hull made of iron from corrosion.
4. Assess the effects of alloying elements.
5. Apply Gibbs phase rule for one component water system with a neat diagram.
6. Find the combusted products of the following components.
   (i) $2H_2$ (ii) CH_4

7. Find the application of colorimetry for the estimation of iron.
8. Calculate the number of the modes of vibrations for the following molecules.
   (i) C_6H_6 (ii) CO_2

Analyse

1. How can the effect of caustic embrittlement in boiler be resolved?
2. Identify the problems created in boilers if priming and foaming takes place.
3. Increase in temperature increases corrosion rate. Justify
4. Zinc is more corroded when coupled with copper than lead – Reason out.
5. Distinguish ferrous and non-ferrous alloys with examples.
6. Arrange the following materials based on their increasing calorific value.

   peat, lignite, bituminous, wood, anthracite and sub-bituminous.

Evaluate

1. Bolt and nut made of the same metal is preferred in practice. Give reason.
2. Support the statement "Coke is a better fuel than coal".
3. Calculate the absorbance if 10% of light is transmitted.
4. Determine the effect of pH of the conducting medium on corrosion.
5. Determine the number of phases present in the following systems.
   (i) Two miscible liquids (alcohol & water)
   (ii) Two immiscible liquids (benzene & water)

Create

1. Derive the probable reason and possible solution for the following:

   i) Stainless steel should not be used to build ship hull.
   ii) Small anodic area results in intense corrosion.
   iii) Metal under water drop undergoes accelerated corrosion.
2. AAS is a better method for environmental analysis than calorimetric analysis. Justify.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15CH203 APPLIED ELECTROCHEMISTRY 3 0 2 4

Course Objectives

- Understanding the basic concepts of electrochemistry and their application
- Expanding knowledge about corrosion and methods of control
- Gaining information regarding principle, working and application of batteries and fuel cells

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Construct an electrochemical cell and calculate its cell potential.
2. Measure the emf of a cell using different electrodes.
3. Identify the components and processes in batteries and infer the selection criteria for commercial battery systems with respect to different applications.
4. Differentiate types of corrosion and its prevention by suitable techniques.
5. Recognize the importance of fuel cells and solar battery.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	2	3												
3	2	1												
4	2	2												
5	3	1												

UNIT I **9 Hours**

FUNDAMENTALS OF ELECTROCHEMISTRY

Introduction - electrical conductance in solution - electrical double layer - electrode potential - importance of electrode potential. Electrochemical cell - standard cell: Weston cadmium cell - Concentration cell: electrode and electrolyte - applications. Applications of electrolytic cells: electrolysis of water, electrolysis of brine and electroplating of copper and gold

UNIT II **9 Hours**

REFERENCE ELECTRODES

Primary and secondary reference electrodes - metal-metal ion electrode, metal-metal insoluble salt electrodes: silver-silver chloride electrode, calomel electrode - ion-selective electrode: glass electrode - measurement of pH of a solution using glass electrode. Quinhydrone electrode: construction - advantages - limitations. Applications of EMF measurements: Potentiometric titrations: acid-base titration - oxidation-reduction titration - precipitation titration

UNIT III **10 Hours**

ENERGY STORING DEVICES

Types of batteries - alkaline, lead-acid, nickel-cadmium and lithium batteries - construction, working and commercial applications. Electrochemical sensors. Decomposition potential: variation of decomposition potential for different metals - importance of decomposition potential. Over voltage: factors affecting over voltage value. Maintenance and precautions in battery handling

UNIT IV **10 Hours**

CORROSION SCIENCE

Corrosion - causes - dry and wet corrosion - Pilling-Bedworth rule - mechanism (hydrogen evolution and oxygen absorption) - rusting of iron. Galvanic series - applications. Galvanic corrosion - differential aeration corrosion (pitting, waterline and stress) - factors influencing corrosion. Corrosion control - sacrificial anode and impressed current cathodic protection methods - Metallic coatings: chromium plating - nickel plating - galvanizing and tinning

UNIT V **7 Hours**

FUEL CELL AND SOLAR BATTERY

Introduction - types of fuel cell: low, medium and high temperature fuel cell. Hydrogen-Oxygen fuel cell - advantages. Solid polymer electrolyte fuel cell, solid oxide fuel cells, biochemical fuel cell. Solar battery - domestic, industrial and commercial applications. Environmental and safety issues

FOR FURTHER READING

Document the various batteries with its characteristics used in mobile phones and laptops Maintenance free batteries, Battery recycling

1 **2 Hours**

EXPERIMENT 1

General instructions to students - Handling reagents and safety precautions.

2 **4 Hours**

EXPERIMENT 2

Determination of strength of a commercial mineral acid by conductometric titration.

3 **4 Hours**

EXPERIMENT 3

Electroplating of copper onto a stainless steel object.

4 **4 Hours**

EXPERIMENT 4

Determination of strength of iron in a given solution by potentiometric method.

5 **4 Hours**

EXPERIMENT 5

Determination of amount of hydrochloric acid present in the given sample using pH meter.

6 **4 Hours**

EXPERIMENT 6

Conductometric titration of mixture of acids.

7 **4 Hours**

EXPERIMENT 7

Determination of corrosion inhibition on mild steel using natural inhibitors.

8 **4 Hours**

EXPERIMENT 8

Estimation of barium by precipitation titration.

Total: 75 Hours

Reference(s)

1. J. C. Kuriacose and J. Rajaram, Chemistry in Engineering & Technology, Vol. 1&2, Tata McGraw-Hill, New Delhi, 2010.
2. B. S. Chauhan, Engineering Chemistry, 3rd Edition, Laxmi Publication Ltd, New Delhi, 2010.
3. B. R. Puri, L. R. Sharma and Madan S Pathania, Principles of physical chemistry, 46th Edition, Vishal publishing Ltd, New Delhi, 2013.
4. B. S. Bahl, G. D. Tuli and Arun Bahl, Essentials of Physical Chemistry, 5th Edition, S. Chand & Company, New Delhi, 2012.
5. S. Vairam, Engineering Chemistry, 1st Edition, John -Willy, India private limited, New Delhi, 2014.
6. Sashi Chawla, Text Book of Engineering Chemistry, Dhanpat Rai Publications, New Delhi, 2010.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	2			2	1	1			2	1		1	1	2			2	1			1	1		20
2	1	4			2	4	1			2			1	2				1	2						20
3		1	1		4	5			2	4			2	1			1	2							23
4	2	1			2	5	1			3				2			2	2				2			22
5	2	2			1	4			2	1			1	1				1							15
Total																									100

Assessment Questions

Remember

1. List any two advantages of hydrogen oxygen fuel cells.
2. Name any two secondary batteries used in electronic appliances.
3. State pilling bedworth rule.
4. List any two applications of lithium battery.
5. Define overvoltage.
6. Recall the two limitations of quinhydrone electrode.
7. List the three major applications of galvanic series.
8. Recall the term redox reaction.
9. Define standard electrode potential.

Understand

1. Identify any two factors affecting the rate of corrosion based on the nature of metal.
2. Compare solar battery with lead acid-battery with respect to cell reactions, advantages and limitations.
3. Explain the working of hydrogen-oxygen fuel cell with necessary diagram and cell reactions. Mention its two advantages and limitations.
4. Identify the four advantages of electroless plating over electroplating.

5. Explain the difference between galvanic and differential aeration corrosion with an example each.
6. Summarize any five factors that affect overvoltage value of a cell.
7. Differentiate cell from battery.
8. Sketch and explain the construction and working of saturated calomel electrode with necessary cell reactions.
9. With a neat sketch explain the working of a silver – silver chloride electrode.
10. Elucidate the working principle of Weston cadmium cell with suitable cell reactions.
11. Distinguish galvanic and electrolytic cells based on cell reactions.

Apply

1. Assess the six advantages of solid polymer electrolyte fuel cell.
2. Many metals form oxide layer when exposed to atmospheric conditions due to corrosion. Predict the four types of metal oxide layers formed with two examples each.
3. An iron pipe line buried under soil is used to carry natural gas, suggest any two corrosion control techniques that can be employed to minimize/control corrosion.
4. Predict the type of corrosion taking place when a piece of iron rod is exposed to moisture and explain the mechanism of rust formation.
5. Illustrate the construction of 6V lead-acid battery and explain its functioning during discharging and charging process.
6. Select a suitable secondary storage battery used in mobile phones. Explain its reactions during charging and discharging process.
7. Find the electrode potential of zinc rod using saturated calomel electrode as reference electrode (E cell value is 1.10 V).
8. Apply the principle of ion selective electrode to find the pH of HCl solution using glass electrode with necessary equations.
9. Can we use KCl salt bridge to construct a cell using Ag and Pb half-cell. Give reason.
10. Identify a suitable technique to achieve copper coating on stainless steel object with a neat diagram.

Analyse

1. Can you store zinc sulphate solution in a copper container? Give reason if your answer is yes/no.
2. Predict why copper cannot displace hydrogen from mineral acid solution.
3. Compare a deep cycle battery and a starting battery based on its application.
4. Zinc corrodes at a faster rate when coupled with copper than lead. Give reason.
5. Does the water exhaust from hydrogen - oxygen fuel cell is drinkable? Give reasons if Yes/No.

Evaluate

1. Electrode potentials of A and B are E0A/A+ = +0.76 V and E0B/B+ = -0.34 V respectively. Choose the appropriate anode half-cell and cathode half-cell by giving the cell representation.
2. Glass electrode cannot be used in solutions having pH greater than 9.0. Give reason.
3. The standard reduction potentials of metals Ag, Fe, Cu and Zn are +0.80v,-0.44v, +0.34v and -0.76v respectively. Arrange the metals in the increasing order of their ability to undergo corrosion.
4. Identify any two advantages of microbial fuel cell over lead acid battery.
5. Represent diagrammatically an electrochemical cell that produces 1.1 volt as an output. Write the half-cell reactions responsible for that.

Create

1. As an engineer, which type of metal oxide forming metal you will choose for your design? Reason out.
2. Derive the probable reason and possible solution for the following:
   i) Stainless steel should not be used to build ship hull.
   ii) Small anodic area results in intense corrosion.
   iii) Metal under water drop undergoes accelerated corrosion.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15CH204 INDUSTRIAL CHEMISTRY 3 0 2 4

Course Objectives

- impart knowledge on the principles of water characterization, treatment methods and industrial applications
- understand the principles and application of electrochemistry, fuel and combustion
- recognize the fundamentals of polymers, nano chemistry and analytical techniques

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. identify the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications.
2. utilize the concepts of electrochemistry in real time applications.
3. realise the importance of fuel chemistry in day to day life.
4. differentiate the polymers used in day to day life based on its source, properties and applications
5. familiarize with the synthesis and characterization techniques of nanomaterials.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	1	2												
3	3	1												
4	2	1												
5	2	2												

UNIT I **10 Hours**

WATER PURIFICATION TECHNOLOGY: SOFTENING AND DESALINATION

Hardness of water: Equivalents of calcium carbonate - Units of hardness - Degree of hardness and estimation (EDTA method). Use of water for industrial purposes: Boiler feed water-scale-sludge - priming and foaming -caustic embrittlement. Softening of hard water: External conditioning - ion exchange methods - Internal conditioning - trisodium, dihydrogen, trihydrogen phosphate and sodium hexameta phosphate- carbonate- colloidal methods. Desalination: Reverse osmosis - electrodialysis. Domestic water treatment - Disinfection of water - break point chlorination

UNIT II **10 Hours**

ELECTROCHEMISTRY

Introduction - EMF - Single electrode potential -Calomel electrode - Glass electrode -pH measurement using glass electrode - Electrochemical series. Cells: Electrochemical cells - Cell reactions- Reversible cells and irreversible cells. Batteries - characteristics of battery - types of batteries, construction, working and applications: Primary (alkaline) and secondary (lead-acid and nickel-cadmium) - Modern batteries (zinc air battery and lithium batteries) - precautions for battery

maintenance. Fuel cell: Hydrogen - Oxygen fuel cell.Electroplating of copper and electroless plating of nickel

UNIT III **8 Hours**

FUELS AND COMBUSTION

Fuel: Introduction - classification of fuels - calorific value - higher and lower calorific values - analysis of coal (proximate and ultimate) - carbonization - manufacture of synthetic petrol (Bergius process) - knocking - octane number - cetane number - natural gas - Compressed Natural Gas (CNG)- Liquefied Petroleum Gases (LPG) - producer gas - water gas. Combustion of fuels: introduction- theoretical calculation of calorific value - calculation of stoichiometry of fuel and air ratio - ignition temperature

UNIT IV **9 Hours**

POLYMER AND COMPOSITES

Monomers - functionality - degree of polymerizations - classification of polymers based on source and applications; porosity - tortuosity - molecular weight determination by Ostwald method - polymerization methods: addition, condensation and copolymerization - mechanism of free radical polymerization -thermosetting and thermoplastics. Polymer blends - composites, significance, blending-miscible and immiscible blends, phase morphology, fibre reinforced plastics, long and short fibre reinforced composites

UNIT V **8 Hours**

NANOMATERIALS

Types of Nanomaterials - Nano particles - nanoclusters - nano rod - nanowire -nano tube. Synthesis: Top down process: laser ablation - electrodeposition - chemical vapor deposition. Bottom up process: Precipitation - thermolysis - hydrothermal - solvothermal process. Carbon nanotubes: Types - production - properties - applications. Working principle and applications - Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - UV-Visible spectrophotometer

FOR FURTHER READING

Application of nanomaterials in medicine, environment, energy, information and communication sectors

1 **2 Hours**

EXPERIMENT 1

General instructions to students - Handling reagents and safety precautions

2 **4 Hours**

EXPERIMENT 2

Water quality of BIT campus - River - Bore well water with respect to hardness, TDS and pH

3 **4 Hours**

EXPERIMENT 3

Determination of strength of hydrochloric acid in a given solution using pH meter

4 **4 Hours**

EXPERIMENT 4

Determination of strength of a commercial mineral acid by conductometric titration

5 **4 Hours**

EXPERIMENT 5

Conductometric titration of mixture of acids

6 **4 Hours**

EXPERIMENT 6

Determination of the strength of iron in the given sample by potentiometric method

7 **4 Hours**

EXPERIMENT 7

Determination of molecular weight of polyvinyl alcohol by Ostwald viscometry method

8 **4 Hours**

EXPERIMENT 8

Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method

Total: 75 Hours

Reference(s)

1. M. Munjal and S.M. Gupta, Wiley Engineering Chemistry, Second edition, Wiley India Pvt. Ltd, New Delhi, 2013
2. A. Pahari and B.Chauhan, Engineering Chemistry, Infinity Science press LLC, New Delhi, 2010
3. P.H. Rieger, Electrochemistry, Springer, Netherland, Second Edition (Reprint) 2012
4. Fred W. Billmeyer JR, Textbook of polymer science, John Wiley & sons, Third edition, 2008
5. G. Cao, Ying Wang, Nanostructures and Nanomaterials: Synthesis, Properties, and Applications, World Scientific, New Jersey, 2011
6. S. Sarkar, Fuels and combustion, 3rd edition, Orient Longman Ltd. New Delhi, 2010

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	1	1	1		2	4	3			1	3		1		3				1						21
2	2	1	2		2	5	2		1	1	3				1				1						21
3	1	2	2		1	3	3			2	2			1	1				1						19
4	1	1	1		3	4	1		1	1	3			1	2				1						20
5	1	1	1		1	2	2			2	3			2	2				2						19
Total																									100

Assessment Questions

Remember

1. Define the term break point chlorination.
2. Name a method to prevent the scale formation in the industrial boilers.
3. Define single electrode potential of an electrode.
4. List any two advantages of H2-O2 fuel cell.
5. Define functionality of a monomer.
6. Name any two thermoplastic and thermosetting polymers.
7. List any two applications of SEM.
8. Recall any two application of X-Ray diffractometer.
9. List three factors which affects the standard electrode potential of cell.

Understand

1. Distinguish between alkaline and non alkaline hardness.
2. Identify two significances of RO method in water treatment.

3. Illustrate any three applications of electrochemical series.
4. Identify the reasons for change of properties of materials at nanoscale.
5. Summarize the four applications of calorimeter.
6. Explain the components of TEM with a neat sketch.
7. Compare bottom up approach with top down approach of nanoparticle synthesis.
8. Indicate any two advantages of water gas over producer gas.
9. Differentiate between thermoplastic and thermosetting plastics.
10. Compare nanocluster with nanocrystal.
11. Why copper cannot displace hydrogen from mineral acid solution?

Apply

1. A water sample contains 204 mgs of CaSO4 and 73 mgs of Mg(HCO3)2 per litre. Calculate the total hardness in terms of CaCO3 equivalence.
2. 100 ml of sample water has hardness equivalent to 12.5ml of 0.08N MgSO4. Calculate hardness in ppm.
3. Find out the single electrode potential of a half cell of zinc electrode dipped in a 0.01M ZnSO4 solution at 25°C? E° Zn/Zn 2+ = 0.763 V, R=8.314 JK-1Mol-1, F= 96500 Coulombs.
4. Calculate the reduction potential of Cu2+/Cu=0.5M at 25°C. E° Cu 2+/ Cu= +0.337V.
5. Find out the weight and volume of air required for the complete combustion of 1 kg of coke.
6. A sample of coal containing 60% C, 6% H, 33% O, 0.5 % S, 0.2% N and 0.3% of ash. Find the gross and net calorific value of coal.
7. Calculate the degree of polymerization of polypropylene having molecular weight of 25200.
8. Apply the principle of ion selective electrode to determine the pH of HCl solution using glass electrode with equations.

Analyse

1. Calgon conditioning is advantageous over phosphate conditioning- reason out.
2. Soft water is not demineralized water whereas demineralized water is a soft water- Jusify.
3. Hydrogen electrode is not generally used for pH measurements – Why?
4. Zinc reacts with dil.H2SO4 to give hydrogen but silver doesn’t liberate hydrogen. Give reasons.
5. Good fuel should have low ash content- Give reasons.
6. Sugar is an example of non-electrolyte -Reason out.

Evaluate

1. Hydrogen fuel is an ideal fuel for the future among all other fuels- Justify.
2. Choose a best method for water purification and explain their components.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15CH205 WATER TECHNOLOGY AND GREEN CHEMISTRY

3 0 2 4

Course Objectives

- Imparting the knowledge on the principles of water technology and green chemistry
- Understanding the principles and applications of green technology in water treatments
- Infer the engineering applications of green chemistry in dyes, corrosion engineering and nanotechnology

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Explain the importance of green chemistry with its emergence and development.
2. Realize the designing of safer methodologies for green technology to meet the objectives of green engineering.
3. Identify the type of corrosion and its mechanism which will help to develop the corrosion control methods.
4. Apply suitable technique to extract natural dye from its source.
5. Familiarize with the synthesis and characterization techniques of nanomaterials.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	2													
3	2	2												
4	1													
5	2	1												

UNIT I **9 Hours**

WATER TREATMENT

Water quality parameters - Hardness of water - Disadvantages of hard water - Degree of hardness and its estimation (EDTA method) - Boiler feed water - Boiler troubles: Priming, foaming and caustic embrittlement - Softening of hard water: Internal conditioning: Sodium hexameta phosphate - Phosphate methods; External conditioning: Ion exchange method - Desalination: Reverse osmosis - Electrodialysis. Domestic water treatment - Disinfection of water - Break point chlorination.

UNIT II **8 Hours**

WASTE WATER ANALYSIS

Basic principles and concept of green chemistry - Need of green chemistry in day-to-day life - Scientific areas for practical applications of green chemistry - Industrial effluents - Waste water analysis: Concept of chemical oxygen demand (COD) and biological oxygen demand (BOD) - Removal of trace pollutants in waste water: Membrane Bioreactor (MBR) technology - Wet oxidation method.

UNIT III **10 Hours**

CHEMISTRY OF CORROSION

Corrosion: Mechanism of corrosion - chemical and electrochemical - Pilling-Bedworth rule - oxygen absorption - hydrogen evolution - galvanic series. Types of corrosion: Galvanic corrosion - differential aeration corrosion (pitting, pipeline, water line and wire fence corrosion) - factors influencing corrosion. Methods of corrosion control: choice of metals and alloys - proper designing - cathodic protection (Sacrificial anode method, impressed current method)-modifying the environment. Protective coatings: Concept of electroplating: electroplating (gold and copper) - electroless plating (nickel and copper).

UNIT IV **9 Hours**

NATURAL DYES

Introduction - definition - classification of natural dyes - concept of chromophores and auxochromes - Extraction process of colour component from natural dyes: Aqueous extraction, non-aqueous extraction - Purification of natural dyes: Chromatography techniques - Types - Column chromatography - thin layer chromatography - Qualitative analysis: UV-Visible spectroscopic study - Mordant: Metallic and non-metallic mordant - advantages and disadvantages of natural dyes.

UNIT V **9 Hours**

NANOMATERIALS

Types of Nanomaterials - Nano particles - nanoclusters - nano rod - nanowire - nano tube. Synthesis: Top down process: laser ablation - electrodeposition - chemical vapor deposition. Bottom up process: Precipitation - thermolysis - hydrothermal - solvothermal process. Carbon nanotubes: Types - production - properties - applications. Working principle and applications: Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - UV- Visible spectrophotometer. Synthesis of Au and Ag nanoparticles using plant extract - Advantages.

FOR FURTHER READING

Protection of metals in concrete against corrosion
Microwave technology on green chemistry

1 **2 Hours**

EXPERIMENT 1

General instructions to students - Handling reagents and safety precautions

2 **4 Hours**

EXPERIMENT 2

Water quality- river/bore well water with respect to hardness and TDS

3 **4 Hours**

EXPERIMENT 3

Determination of strength of hydrochloric acid in a given solution using pH meter

4 **4 Hours**

EXPERIMENT 4

Estimation of strength of iron by potentiometric method using calomel electrode

5 **4 Hours**

EXPERIMENT 5

Extraction of a natural dye by aqueous extraction method

6 **4 Hours**

EXPERIMENT 6

Measurement of rate of corrosion of mild steel in aerated neutral/acidic/alkaline solution by weight loss measurements/Tafel polarization method

7 **4 Hours**

EXPERIMENT 7

Determination of dye concentration in a given sample by using UV-Visible spectroscopic method

8 **4 Hours**

EXPERIMENT 8

Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method

Total: 75 Hours

Reference(s)

1. M. Munjal and S.M. Gupta, Wiley Engineering Chemistry, Second edition, Wiley India Pvt. Ltd, New Delhi, 2013
2. V K Ahluwalia, Green Chemistry - Environmentally Benign Reactions, Ane Books Pvt. Ltd., New Delhi, 2nd Edition, 2012
3. Giusy Lofrano, Green Technologies for Wastewater Treatment - Energy Recovery and Emerging Compounds Removal, Springer Dordrecht Heidelberg, New York, London, 2012
4. Ashis Kumar Samanta and Adwaita Konar, Natural Dyes - Dyeing of Textiles with Natural Dyes, Dr.Emriye Akcakoca Kumbasar (Ed.), InTech Publisher, New Delhi, 2011
5. J. C. Kuriacose and J. Rajaram, Chemistry in Engineering & Technology, Vol. 1&2, Tata McGraw-Hill, New Delhi, 2010
6. David Pozo perez, Nanotechnology and Nanomaterials, InTech Publishers, NewDelhi, 2010

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	2			3	3				3	3			2	1							1			20
2	2				3	4				2	2			2	1			1							17
3	1	2	1		4	3	3			1	3			1	2			2							23
4	1	2			6	6				3												2			20
5	3	2	2		3	6	2		2																20
Total																									100

Assessment Questions

Remember

1. List out any four water quality parameters.
2. Name the salts responsible for temporary hardness of water.
3. Recall any two practical applications of green chemistry.
4. Define wet oxidation in waste water treatment.
5. State Pilling Bed-worth′s rule.
6. Recall any two examples for differential aeration corrosion.
7. Name any two natural dyes.
8. Recall the role of auxochromes in dyes.
9. Name the four methods of nanomaterial synthesis.
10. Name any two plant extracts used in silver nanoparticles synthesis.

Understand

1. Hardness of water is always expressed in terms of CaCO3 equivalent. Reason out.
2. Soft water is not demineralized water whereas demineralized water is soft water - Justify.
3. Represent the need of green chemistry in waste water treatment.
4. Indicate the importance of MBR technology in waste water treatment.
5. Express the mechanism of wet corrosion.
6. Bolt and nut made from same metal is preferred in practice. Reason out.
7. Classify the types of natural dyes based on their chemical structure.
8. Compare the properties of metallic and non-metallic mordents.
9. Infer any two important needs of green chemistry in nanotechnology sector.
10. Identify the physicochemical and engineering properties of nanomaterials.

Apply

1. A sample of water contains 180 mgs of MgSO4 per litre. Calculate the hardness in terms of CaCO3 equivalents. (Molecular weight of MgSO4 is 120).
2. Calculate the non-carbonate hardness of a sample of water containing the dissolved salts as given below in mg/l Mg(HCO3)2 = 7.3; Ca(HCO3)2 = 40.5 and NaCl =50.
3. Select the scientific areas for the practical applications of green chemistry.
4. Predict the significance of sacrificial anode in the prevention of corrosion.
5. Execute the principle of electro-deposition to achieve copper coating on stainless steel object with a neat diagram.
6. Select a suitable technique used for the purification of natural dye.
7. Assess the role of Scanning Electron Microscope (SEM) in nano-materials characterization.

Analyse

1. Distinguish between scale and sludge.
2. Identify the four reasons for boiler troubles.
3. Differentiate between BOD and COD.
4. The rate of corrosion increases with increase in temperature. Give reason.
5. Outline the effect of pH of the conducting medium on corrosion.
6. Differentiate chromophores & auxochromes in dyes.

Evaluate

1. Substantiate the statement that nature of the environment affects corrosion.
2. Choose any two best methods to synthesis nanoparticles.

Create

1. Plan and execute a method to get pure water from waste water using available low coast material in your area.
2. Relate the characteristic properties of natural with synthetic dyes.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	20
Preparation / Pre 10	5
Experiment & Results / E&R 10	5
Final Lab EXamination / Final 100	20

15IT001 SOFTWARE TESTING METHODS AND TOOLS

3 0 0 3

Course Objectives

- Provide fundamental concepts in software testing process.
- Learn various software testing issues and solutions in system testing.
- Understand how to plan a test project, design test cases and conduct testing operations.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Apply software testing fundamentals to identify the origin of defects.
2. Design testing strategies to enhance software quality.
3. Design test cases for unit test, integration test, system test, regression and acceptance test.
4. Manage test plan components, test measurements and reviews for the developed software
5. Perform Testing in the software designed with various testing tools

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2		1								1	
2	3		2										1	
3		3	3						2	2			1	
4				2	3						1		1	
5		1			1						2	2		1

UNIT I **8 Hours**

SOFTWARE TESTING FUNDAMENTALS

Testing as an Engineering Activity - Role of Process in Software Quality - Testing as a Process- The six essentials of software testing - Basic Definitions: Software Testing Principles - The role of a software tester - Origins of Defects- Defect Classes the Defect Repository. Analysis of Defect for a project

UNIT II **10 Hours**

TESTING DESIGN STRATEGIES

Introduction to Testing Design Strategies - Black Box testing - Random Testing - Equivalence Class Partitioning - Boundary Value Analysis - Cause and error graphing and state transition testing - White-Box testing - Test Adequacy Criteria - Coverage and Control Flow Graphs-Covering Code Logic Paths - White-box Based Test design.

UNIT III **10 Hours**

LEVELS OF TESTING

The Need for Levels of Testing- Unit Test - Unit Test Planning- Designing the Unit Tests - The Test Harness - Running the Unit tests and Recording results - Integration tests- Designing Integration Tests - Integration Test Planning - System Test Types-of system testing - Regression Testing. Alpha - Beta and Acceptance Test.

UNIT IV **8 Hours**

TEST MANAGEMENT

Testing and Debugging Goals and Policies - Test Planning - Test Plan Components - Test Plan Attachments - Locating Test Items - Reporting Test Results - The role of three groups in Test Planning and Policy Development - Process and the Engineering Disciplines- Introducing the test specialist - Skills needed by a test specialist.

UNIT V **9 Hours**

TEST MEASUREMENTS AND REVIEWS

Defining Terms - Measurements and Milestones for Controlling and Monitoring - Status Meetings - Reports and Control Issues - Criteria for Test Completion - SCM - Types of reviews - developing a review program - Components of Review Plans - Reporting review results.

FOR FURTHER READING

Case study on Winrunner testing tool.

Total: 45 Hours

Reference(s)

1. S Limaye, Software Testing Principles, Techniques and Tools, McGraw Hill, 2009.
2. Boris Beiser, Software Testing Techniques, Dreamtech press, New Delhi, 2009.

3. http://www.tcs.com/SiteCollectionDocuments/WhitePapers/AFrameworkforAutomatingTestingofNetworkingEquipment.pdf

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	1	2			2	1				1									12						19
2		2				2	2						1	2	12										21
3	1	2			2					1	12			1											19
4		1	2		2	1			2								1						12		21
5		1			1	2							1						1			12		2	20
Total																									100

Assessment Questions

Remember

1. List out the phases involved in the software life cycle model.
2. Examine and present the information present in a test case.
3. Specify four metrics of Equivalence partitioning.
4. Classify the test adequacy criteria based on the test cases specified.
5. List out the errors that are uncovered by black box testing.
6. Classify the major activities associated with Software Configuration Management in Software testing and explain in detail.
7. A programmer using a mutation analysis tool finds that a total of 35 mutants have been generated for a program module A. Using a test set she has developed she finds after running the tests the number of dead mutants is 29 and number of equivalent mutants is 2.
   i)What is the mutation score for Module A? Is the test set for Module A adequate?
   ii) Illustrate the testing activities behind Control Flow Graph.
8. Differentiate between verification and validation.
9. List the sources of Defects or Origins of defects.
10. Define the term cyclomatic complexity.

Understand

1. Why is testing plan important for developing a repeatable and managed testing process?
2. Describe the principles involved in software testing.
3. Illustrate the defect classes with required example for each defect class.
4. Describe the two major assumptions of Mutation Testing.
5. Discuss in detail about evaluating Test Adequacy Criteria and axioms/properties provided by Weyuker.
6. Differentiate between object-oriented and procedural testing.
7. Is it possible to consider a method as a testable unit? Justify
8. Cost of quality increases as the system life cycle progresses. How? Explain with an example.
9. Can user participate in testing? Justify
10. Outline the need of test planning and illustrate the test plan components in software testing.

Apply

1. Analyze the importance of a tester to use both white and black box based testing techniques to evaluate a given software module.
2. Examine the role of Unit and Integration Testing in the phase of Software Testing.
3. For the following construct, describe the set of tests you would develop based on the number of loop iterations in accordance with the loop testing criteria.

```
for (i=0;i<50;i++)
{
text_box[i] =value[i];
full=full-1;
Â }
```

4. The module that has been devised by you has the following conditional statements:
   if (value<100 and found== true)
   call (enter_data (value))
   else
   Print ("data cannot be entered")
   calculate its cyclomatic complexity.
5. Develop the black box test cases using equivalence class portioning and boundary value .Analysis to test a module that is software component of an n ATM system. The module reads in the amount the user wishes to withdraw from his/her account. The amount must be a multiple of $5.00 and be less than or equal to $200.00.Be sure to list any assumptions you make and label equivalence classes and boundary values.
6. Draw a flow graph for the following code and calculate its cyclomatic complexity and justify how this value is useful to the tester?
   Sum=0
   Read (n)
   I=1
   Â While (i<=n)
   Read (number)
   Sum=sum+ number
   I=i+1
   End while
   Print (sum)
7. Develop a code for finding the sum of the square of n natural numbers and also find the types of defects that may occur in your coding and how it affects the system?
8. Consider that you are developing software which facilitates on-line shopping of television set from an online vendor. Design the set of tests you will use during system testing to evaluate the software.
9. A project manager estimates that the total costs of a project as Rs. 3,75,000. The project is a business application. There are security, performance and configuration requirements. The testers are experienced and have tool support and training. The number of test procedures is estimated at 670, with a ratio of 5.9 hours/test procedure from the historical database of similar projects. Assume that the salary of the testers is Rs.37/hour. Estimate the costs of test for this project in as many ways as you can with the information given.
   Â
10. Apply the equivalence classes and boundary values and develop a set of test cases to cover them for the following module description: The module is part of a public TV membership system. The module allows entry of a contribution from $0.01 to $99,999.99. It also enters a member status for the contributor that can be: regular, student/retiree, or studio club

Analyse

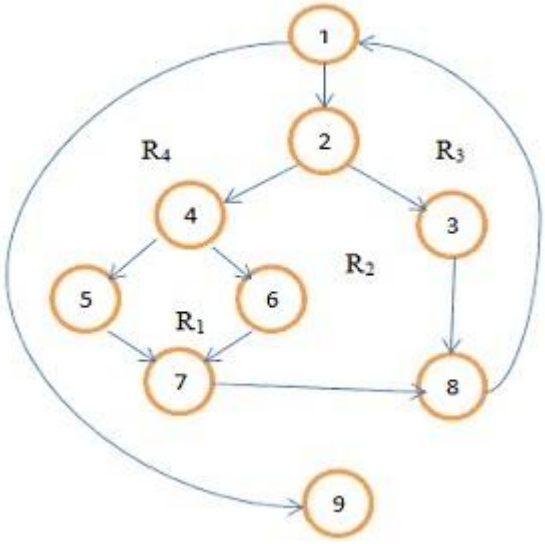
1. Suppose you were reviewing a requirements document and noted a feature was described incompletely. How would you classify this defect? How would you insure that it was in corrected?
2. Suppose you are a member of a team that was designing a defect repository. What organizational approach would you suggest and why? What information do you think should be associated with each defect? Why is this information useful, and who would use it?
3. With Respect to principle 3-“test results should be meticulously inspected”-why do you think this is important to the tester?
4. According to Principle 5, relate the importance of test cases for both valid and invalid conditions.
5. Assume an online fast food restaurant system. The system reads customer orders, relays orders to the kitchen, calculates the customer’s bill and gives change. It also maintains inventory information. Each wait-person has a terminal. Only authorized wait persons and a system administrator can access the system.
   (i) Which type of tests would you perform for the software application described above?
   (ii) For each type of test

Specify test objectives.
Give a general description of the tests you would develop and tools you would need.
You may make any assumptions related to the system characteristics what are needed to support your answers.

6. Programmer A and Programmer B are working on a group of interfacing modules and A tends to be a poor communicator. In this situation, what types of defects are likely to surface?
7. what is the role of testing tools in software field?How are tools selected and used?
8. Testing can detect only the presence of errors, not their absence.Why?
9. Differentiate verification and validation.

Evaluate

1. Find out the Cyclomatic complexity V(G) of the given flow graph.



2. Define the equivalence classes and boundary values to cover them for the following module description: The module is part of a public TV membership system. The module allows entry of a contribution from Rs.100 to Rs.10000. It also enters a member status for the contributor that can be: regular, student/retiree.

Create

1. Develop a use case to describe a user purchase of a laptop with credit card from a online vendor using web- based software. With use case, design a set of tests you would use during system test.
2. Create tables containing test data that will enable you to achieve (i) Simple Decision Coverage (ii) Condition Coverage (iii) decision /Condition Coverage.
   Â

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT002 C# AND .NET **3 0 0 3**

Course Objectives

- Understand the concepts to develop window application and web application using .Net framework
- Develop background knowledge as well as core expertise in C#

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Use the development products of .NET Framework and connect to the CLR and .NET Framework for building C# Applications.
2. Develop C# Applications using C# basics and OOP concepts.
3. Demonstrate the concepts of interfaces, delegates, events and collections in C#.
4. Design the windows and forms based applications using C#.
5. Design web based applications using C#, ASP.NET, and ADO.NET.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1	1											
2	1	1	2								1		1	
3	1	1	2											
4	1	1	2		2						2		2	
5	1	2	3		2						2		2	

UNIT I **8 Hours**

BASICS OF .NET AND C#

Architecture of .Net Framework - Benefits- Components-CLR - CTS -Class Library - C# Relationship with the CLR - The CLR and .NET Framework.

UNIT II **10 Hours**

C# AND OOP

C# data types - Variables - Operators - Statements - Control flow - Methods - Debugging and error handling - Namespaces - Array - Structs - OOP concepts - Classes - Abstract data type - Constructors - Destructors - Conversions - Operator overloading - Polymorphism.

UNIT III **9 Hours**

INTERFACES

Interfaces - Indexes - Delegates - Events - Variable argument Lists - Collection - Reflection - Events - Dynamic datatypes - Dynamic language Runtime.

UNIT IV **9 Hours**

WINDOWS FORMS

Forms and Controls - Windows Presentation Foundation Features - Architecture - Class Hierarchy - Application Model - Properties - WPF Events - Data Binding in Windows forms.

UNIT V **9 Hours**

ASP.NET

ASP.Net Life cycle - Page Directives - Web server control - Data access with ADO.Net - Data Binding in - WPF applications - Security features in .Net - Roles - Policies.

FOR FURTHER READING

Case Study : File management with I/O

Total: 45 Hours

Reference(s)

1. Kogent Solutions Inc, C# 2012 Programming covers .NET 4.5, DreamTech Press, 2014
2. Joseph Albahari and Ben Albahari, C# 5.0 in a Nutshell, Oreilly Media, 2012
3. Christian Nagel, Professional C# and .Net,Second Edition, Wiley-India, 2010
4. Herbert Schildt, C# 4.0 The Complete Reference, Tata McGraw Hill, 2010

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1		2				2					4			2				4							14
2			2				6			6											6				20
3					8						8				8										24
4						8					8			8				6							30
5															4							8			12
Total																									100

Assessment Questions

Remember

1. Give the benefits of .net Framework class Library.
2. List out any five classes under System namespace.
3. Discuss about the .NET namespaces and explain the unique features that will make the application more difficult to develop in other languages.
4. Name the Interfaces supported by Non generic Collection.
5. Give the syntax for the get and set accessor of attached properties.
6. List out the categories of controls supported in window based application and explain the importance of each.
7. List the two predefined reference types in C#.
8. Name the Controls in Windows presentation class.

9. Describe the architecture the .Net Framework and show the tools provided for managing the user- and application interfaces.
10. Define Common Language Runtime.

Understand

1. State the use of "new" keyword in inheritance concept.
2. Differentiate between Structure and Class in C#
3. Mention the built in data source controls in ASP.NET provided by .NET Framework
4. Compare the architecture of ADO with ADO.NET.
5. Explain the web Server architecture. What are the steps involved in the creation and consumption of web services. Explain with an example
6. Discuss about the services provided by CLR to programs developed using C# with the important services the Framework Base class Library offer to the users.
7. Describe the visibility of class members declared with the following modifiers
   a) Public
   b) Private
   c) Protected
8. Distinguish between WPF and WCF.
9. Difference between collection and Reflection.
10. How cts is used to implement OOP in C#?

Apply

1. Develop a C# code to declare a constructor for the time class that accepts a single argument, an object of type DateTime and initialize all the member variables based on values in that object.
2. Write a menu-driven application using C# with the following
   (i)File Menu option
   (ii)About Menu option.
   Show the execution model using an example.
3. A company maintains two separate arrays containing the identification numbers and hourly wage rate of its employees. This information is maintained in increasing order of the employee number. Write a c# program for insertion and deletion of employee information.
4. Write a code to disable a windows form when a button is clicked.
5. Write a C# program to program that will accept a whole number as input and will print the number of each type of denomination it takes to equal the given input.Use the denominations 500, 100, 50, 20, 10, 5, 1.
6. Demonstrate a C# console application for converting the US dollars to Indian rupees for the each value entered by the user with the following
   For statement
   do statement
7. Design a class name with the methods containing the following members Two integer data members minutes and Hours Two Constructors
8. Let's consider a class which has Name and Property fields. The application should Produce the output as given below. You can Create a Property class and store the values as given below in an indexer and access the details of the property by giving the property code. Analyze the problem and experiment it using C# program.
   Property #:920119
   Condition: Excellent
   Bedrooms:5
   Bathrooms:3
   Market Value: 2,650
9. Find the Errors in the following code.
   Class emp : employee
   {
   private string str
   public string firstname

```
{
get;
{
return str;
}
set;
{
str == value;
}
}
}
```

10. Calculate the age of a person in terms of years, months and days by using parameterized Constructors and default constructorsCalculate the age of a person in terms of years, months and days by using parameterized Constructors and default constructors

Analyse

1. Consider a bank application. Cheque clearing box is in process to clear 10 cheques per day. The Constraint is the Bank clerk can able to pass only local cheques on the same day and remaining cheques by the next day. Analyze the problem and write a C# program to address this problem in the bank application.
2. If an exception occurs then the program terminates abruptly without getting any chance to recover from the exception. As a programmer Illustrate the use of Exception handling with all mechanism to handle the errors and conclude by the use of CLR in this scenario.
3. Let's consider an Employee class which has Name and JobGrade fields. I want to overload the comparison operators for this class so that it can participate in all types of comparison including <. <=, ==, >=,& != . I want to translate the comparison in-between two Employee objects to be compared between the JobGrade. Since I do not want to write the comparison logic each time, typically I'd implement the comparison in one main method and from comparison operator overloading methods call this main method. Analyze the problem and experiment using C# program
4. Create a class called Accounts which has data members likeACOUNT no, Custome name, Account type, Transaction type (d/w),amount, balance D- >Deposit W- >Withdrawal If transaction type is deposit, call the credit(int amount) and update balance in this method. If transaction type is withdraw, call debit (int amt) and update balance. Pass the other information like Account no, name, Account Type through constructor. Call the show data method to display the values. Construct a class ThreeD which demonstrate to overload unary and binary operator along with an output.
5. Design a class name Time containing the following members Two integer data members minutes and Hours,Two overloaded Constructors,One method to display the class members.

Evaluate

1. Demonstrate the use of foreach loop to display the contents of a string array which contains name of ten varieties of food available in Hotel Called ParadiZeIn.
2. Write a C# program to convert the given four-digit number in words format like "One Nine Seven Eight".
3. How will you create variable size array in c# program? Explain how it is different from a normal array
4. Why do we need webform Authentication? Examine and give three security scenarios for web applications with ASP.net authentication types.
5. How does code behind model work in ASP.net which occurs during various stages of a system development life cycle? Analyze and give your explanation with an example during the Precompilation stage

Create

1. Create a database application to display the details of student marks in a datagrid control. Write the database connection code using ADO.net with all connection string and adapter codes with packages.

2. Create a C# code to declare a constructor for the time class that accepts a single argument, an object of type DateTime and initialize all the member variables based on values in that object.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT003 SOFTWARE QUALITY MANAGEMENT 3 0 0 3

Course Objectives

- Learn about various Software quality models
- Gain knowledge about Quality measurement, implementation and documentation
- Know about standards and certifications

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Analyze the relations among software product, process and project in quality assurance and management
2. Design process and quality models for developing and assessing software products and processes;
3. Evaluate quality system standards for software products and processes.
4. Design and analyze the software tools for improving the software quality

5. Analyze the concepts and elements of quality management systems.Analyzing how to manage CRM.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3				3	1		2		2	3		2	3
2	3		3		3		3		3		3	2	3	3
3		3		3		1	3		2		3		2	3
4	1		3		2		1	2		2	1		2	
5	1		3		3			3	1		2	3		2

UNIT I **9 Hours**

INTRODUCTION

The Software Quality Challenge -Software Quality Factors -Components of the Software Quality Assurance System. Pre-Project Software Quality Components - Contract Review -Development and Quality Plans.

UNIT II **9 Hours**

SOFTWARE QUALITY STANDARDS

Software Quality -Hierarchical models of Boehm and McCall - Quality measurement - Metrics measurement and analysis -GQM Model- Need for standards -ISO 9000 Series - ISO 9000-3 for software development.

UNIT III **9 Hours**

SOFTWARE QUALITY INFRASTRUCTURE COMPONENTS

Procedures and Work Instructions - Supporting Quality Devices - Staff Training, Instructing and Certification -Preventive and Corrective Actions -Configuration Management -Documentation and Quality Records Controls.

UNIT IV **9 Hours**

QUALITY CONTROL AND RELIABILITY

Tools for Quality -Ishikawas basic tools - CASE tools -Defect prevention and removal - Reliability models-Reliability growth models for quality assessment

UNIT V **9 Hours**

QUALITY MANAGEMENT SYSTEM

Elements of QMS -Rayleigh model framework - Reliability Growth models for QMS - Complexity metrics And model

FOR FURTHER READING

Gilbs approach- Documentation- Rayleigh model- Customer satisfaction analysis- CMMI- Six Sigma

Total: 45 Hours

Reference(s)

1. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Pearson Education, 4th edition, 2014.
2. Daniel Galin, Software Quality Assurance: From Theory to Implementation, Pearson Addison Wesley, 2012.
3. Roger S. Pressman, Software Engineering-A PractitionerÃ¢??s Approach, McGraw Hill pub.2010.

4. Allan C. Gillies, Software Quality: Theory and Management, Thomson Learning, 3rd edition, 2011.
5. Mary Beth Chrissis, Mike Konrad and Sandra Shrum, CMMI for development, Pearson Education, 2011
6. E. Norman Fenton and James Bieman, Software Metrics, Taylor & Francis Group, 2010

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1		5					5		3				3					3					3		22
2			5			5				3			3						3						19
3	5						5				4														14
4		6			4			6	5						4										25
5			9				5										3							3	20
Total																									100

Assessment Questions

Remember

1. What makes the QA work minimal?
2. What are the Characteristics of Software quality assurance?
3. What is software inspection?
4. What are the Ishikawa's basic tools in software development?
5. Define Defect removal efficiency.
6. Define Jelinski Moranda model.
7. Define LittleWood model.
8. Define Goel Okumoto Nonhomogeneous Poison Process model(NHPP)
9. Define Musa-Okumoto Logarithmic Poison Execution Time model.
10. Define The Delayed S and Inflection S.
11. Define Lines of Code
12. Define Halstead's Software Science.

Understand

1. Give the role of a project manager.
2. Define MTTF as a measure of reliability
3. What are the ways of killing the Quality Assurance?
4. What are reliability models?
5. What is Rayleigh mole?
6. Write down the advantages and disadvantages of survey methods
7. What are the survey methods of Customer satisfaction?
8. What are the key areas of guidance given by ISO 9000-3 standard?
9. What are the requirements of ISO9001?
10. What is the impact of ISO9000
11. What are the five levels of SEI CMM?
12. What is Defect Injection?
13. What are the activities associated with Defect injection and Removal?

Apply

1. How to apply Goel Okumoto imperfect debugging model.
2. How to use Cyclomatic Complexity for SQM.
3. Honeywell is the organization responsible with a specialized operating system and hundreds of user application programs, software acquisition, integration, testing and maintain quality assurance program. Construct Software Maintenance model by using Pareto Principle for organization by considering manpower and cost function.

4. Programmer A and Programmer B are working on a group of interfacing modules. Programmer A tends to be a poor communicator and does not get along well with the rules to create programming modules. Due this situation, what types of defects are likely to surface in these interfacing modules?
5. Implement the five effective methods to ensure the failure of software quality assurance?
6. George Wise is an exceptional programmer. Testing his software modules reveals very few errors, far fewer than the team's average. He keeps his schedule promptly, and only rarely is he late in completing his task. He always finds original ways to solve programming difficulties, and uses an original, individual version of the coding style. He dislikes preparing the required documentation, and rarely does it according to the team's templates.
   A day after completing a challenging task, on time, he was called to the office of the department's chief software engineer. Instead of being praised for his accomplishments (as he expected), he was warned by the company's chief software engineer that he would be fired unless he began to fully comply with the team's coding and documentation instructions.
   (1) Do you agree with the position taken by the department's chief software engineer?
   (2) If yes, could you suggest why his or her position was so decisive?
7. Consider McCall's model and the Deutsch and Willis model.
   (1) What are the formal differences between the models?
   (2) What are the content differences between the models?
   (3) What new subjects were actually added by the Evans and Marciniak model to McCall's model?
8. The SCM Authority is expected to spend a significant part of its resources in carrying out software configuration audits.
   (1) List the main SQM audit tasks.
   (2) Give the contribution of each task to software quality.
9. CMM and CMMI are both composed of almost identical capability maturity models.While CMM bases its assessments on 18 key process areas, CMMI employs24 process areas.
   (a) Indicate which of the capability levels have been substantially changed.
   (b) Can you characterize the observed changes?
10. The ISO and the IEC are neither capable of nor interested in carrying out certification audits. How are standards organizations assuring the performance of audits conducted with the same method and requiring the same level of
    achievement in the same subjects for organizations worldwide?

Analyse

1. Explain the differences between the CMM and CMMI process areas in relation to the respective subject matter.
2. Compare the 9000-3 requirements with the processes to be assessed according to 15504. Discuss differences in subject matter as well as approach.
3. Compare CMM, Six Sigma and ISO

Evaluate

1. Describe the general principles underlying quality management according to ISO 9000-3.
2. Explain the benefits of the use of SQA standards.
3. Explain the main contributions of checklists to software quality assurance.
4. Explain the contribution of procedures to software quality assurance.
5. Explain the contribution of CASE tools to the quality of software maintenance.
6. Explain in Detail about the Ishikawa's basic tools in software development .
7. Evaluate five methods suggested by waats for measuring quality

Create

1. Draw the Cause and effect diagram of Design Inspection.
2. Suppose we have to develop software on Banking application processing system. The software should provide the features such as account creation, credit, debit, account transaction form online, present information available in the account holder offered by the

bank and display the report of each transaction made by the customer. Prepare a work breakdown structure for the tasks to be performed and explain how you will develop the quality software product.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT004 REAL TIME SYSTEMS 3 0 0 3

Course Objectives

- Apply the knowledge of operating system concepts to understand real time system concepts like tasks and scheduling.
- Address the fundamental problems of real-time system
- Identify and assess the relevant literature and research trends of real-time systems

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Apply the fundamental concepts and terminology of real-time systems
2. Understand the various protocols for effective resource sharing
3. Analyze the various parameters related to the different types of scheduling in single processor and multiprocessor environments.
4. Identify the need for Real-Time Operating Systems (RTOS) and elaborate how to schedule real-time tasks
5. Assess the need for Real-Time Communication in real-time systems

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		-							1				
2		1												
3		2	2			1								
4	1	-	2					1						
5	1	1							1					

UNIT I **8 Hours**

INTRODUCTION TO REAL TIME SYSTEMS

Fundamentals of Real Time Systems-Characteristics of Real Time Systems-Safety and Reliability in Real Time Systems- Basic model of a Real Time System-Applications of Real time Systems-Types of Real time tasks-Timing constraint-Types and Modeling

UNIT II **9 Hours**

REAL TIME TASK SCHEDULING

Task Scheduling-Basic concepts and Terminologies-Classification of Real Time Task Scheduling Algorithms-Clock Driven Scheduling-Table Driven Scheduling-Cyclic Schedulers-Hybrid Schedulers-Event Driven Scheduling-Earliest Deadline First (EDF) Scheduling-Rate Monotonic Algorithm (RMA) Scheduling

UNIT III **9 Hours**

HANDLING RESOURCE SHARING AMONG REAL TIME TASK

Resource Sharing among Real Time Task-Priority Inversion-Priority Inheritance Protocol (PIP)-Highest Locker Protocol (HLP)-Priority Ceiling Protocol (PCP)-Types of Priority Inversion under PCP-PCP features- Issues in using a Resource Sharing Protocol

UNIT IV **10 Hours**

REAL TIME OPERATING SYSTEMS (RTOS)

Scheduling Real time tasks in Multiprocessor and Distributed Systems-Multiprocessor Task Allocation-Dynamic Allocation and Fault-tolerant Scheduling of Tasks-Clocks in Distributed Real Time Systems-Real Time Operating Systems-Time Services and Features-UNIX as a Real Time Operating Systems-Windows as a Real Time Operating System-POSIX and some other RTOS.

UNIT V **9 Hours**

REAL TIME COMMUNICATION

Basic Concepts of Real Time Communication-Real Time Communication in a LAN- Soft and Hard Real Time Communication in a LAN-Bounded Access Protocol for LAN- Real Time Communication over Packet Switched Networks-Routing-Resource Preservation-Rate control and QoS Models.

FOR FURTHER READING

Basic Databases concepts-Real Time Databases-Characteristics of Real Time Databases -Commercial Real Time Databases-Applications of Real Time Databases

Total: 45 Hours

Reference(s)

1. Rajib Mall, Real-Time Systems: Theory and Practice,Third Edition,Pearson, 2009.
2. Philip Laplante, Real-Time Systems Design and Analysis, Fourth Edition, Prentice Hall of India,2013.
3. Krishna and Shin, Real-Time Systems, Tata McGraw Hill. 2010.
4. Jane W.S. Liu, Real-Time Systems, Pearson Education, 2007.
5. Alan Burns and Andy Welling, Real-Time Systems and Programming Languages, Addison Wesley long main, 2009.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4					6	6			4															20
2	4					6					6			2										2	20
3							2			6				2											10
4		2				6								6	6			6					4		30
5	2					6												12							20
Total																									100

Assessment Questions

Remember

1. List the characteristics of Real Time Systems
2. Mention some applications of Real Time Systems
3. List some Real Time Task Scheduling Algorithms
4. Enumerate different type of Real time tasks
5. State the two approaches to achieve internal synchronization in Real time Systems
6. List the features of Real time operating systems.
7. Mention some applications of Real Time Communication.
8. Name any two important sensor and actuator devices used in real-time applications.
9. Illustrate UNIX and Windows as Real-time operating systems.
10. What is Lynx?

Understand

1. Briefly explain about the model of Real Time Systems
2. Describe how timing constraints can be modeled in Real time Systems
3. Illustrate some issues in using RMA to practical situations
4. Explain how PCP can be used for resource sharing among a set of tasks when the tasks are scheduled using EDF?
5. Discuss two popular dynamic real-time allocation algorithms.
6. Discuss the requirements of POSIX as Real Time Operating systems
7. Explain the architecture of LAN use in Real time Communication.
8. What do you understand by jitter associated with periodic tasks?
9. What do you understand by the term “priority inversion” and “inherited priority inversion”?
10. Describe the focused addressing and bidding and the buddy schemes for running a set ofÂ real time tasks in distributed systems.

Apply

1. Illustrate different timing constraints with a example of Telephone system.
2. Compare and contrast Earliest Deadline First (EDF) andÂ Rate Monotonic Algorithm (RMA) Scheduling algorithm
3. Explain how PCP is able to avoid deadlock ,unbounded priority inversions, and chain blocking
4. Identify the key difference between hard real-time, soft real-time and firm real-time systems.
5. Explain using an exampleÂ as to why critical resources can get corrupted if the task using it is preempted and another Â task is granted use ofÂ the resources.
6. What is the purpose of buddy algorithms in distributed environment?
7. What is a watchdog timer?
8. What problems arise if the system calls are indistinguishable from procedure calls?
9. Reason the difference betweenÂ a self host and target host based embedded operatingÂ systems.
10. How global arbitration is achieved using virtual time protocol?

Analyse

1. Â Is EDF really a dynamic priority scheduling algorithm ?Justify

2. Is it possible to devise a resource sharing protocol which can guarantee that no task undergoes priority and unbounded priority inversion. Justify?
3. Why is it necessary to synchronize the clocks in a distributed real-time systems
4. Compare the two dynamic real-time allocation algorithms with respect to communication overhead and scheduling proficiency.
5. Compare the advantages and disadvantages of using a ring network and collision based network for real-time communications.
6. Explain the difference between traffic shaping and policing.
7. Analyze the role of concurrency control protocol in a database.

Evaluate

1. Examine the reasons of shortcomings of using UNIX as a Real Time Operating Systems.
2. Give the rate at which the clocks need to be synchronized using a simple central time server method?
3. Consider the use of timed token protocol (IEEE 802.4) in the following situation. We have four nodes in the system. The real-time requirement is that a mode Ni be able to transmit up to bi Kbits over each period of duration Pi milliseconds, where bi and pi are given in the table below. Assume that the propagation time is negligible compared to TTRT and that the network bandwidth is 1 Mbps

Node	**bi**	**Pi**
N1	100Kb	10 msec
N2	200Kb	15msec
N3	500Kb	100msec

Create

1. Construct an example involving three periodic real time tasks which would be schedulable under EDF but unschedulable under RMA .Justify your answer
2. Suppose you are the manufacture of small embedded components used mainly in consumer goods such as automobiles, MP3 player etc. Would you prefer to use PSOS, WinCE or RT-Linux in your embedded component?

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT005 PARALLEL PROCESSING 3 0 0 3

Course Objectives

- Understand the scope, design and model of parallelism.
- Know the Characteristics, model and design of parallel algorithms.
- Solve a complex problem with message passing model and programming with MPI.
- Analyze complex problems with shared memory programming with openMP.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Analyse the requirements for programming parallel systems and critically evaluate the strengths and weaknesses of parallel programming models and how they can be used to facilitate the programming of concurrent systems.
2. Discuss the difference between the major classes of parallel processing systems and design software solutions for a number of parallel processing models.
3. An ability to analyze a problem and identify the computing requirements appropriate for its solution; design implement and evaluate a problem based on real time computer applications and problem statements.
4. Analyse the speed up issues related to parallel processing.
5. Analyze the efficiency, Design and implement a parallel processing system and evaluate the types of application for which parallel programming is useful

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		2	3										1
2	3		2	3							3	2	1	1
3	1	2											2	1
4		2												1

5		2	2	3								2	1	1

UNIT I **9 Hours**

INTRODUCTION TO PARALLEL PROCESSING

Motivation for Parallelism: Parallel Computing, Speed Up, Moores Law, Grand Challenge Problems, Trends; Parallel and Distributed Computers: Flynns Taxonomy, Distributed Memory Multicomputer, Shared Memory Multiprocessors

UNIT II **9 Hours**

MESSAGE PASSING COMPUTING

Process Creation, Message Passing Routines, Point-to-Point, Collective Communication; MPI and PVM: MPIModel of Computation, Basic Concepts - MPI_Init, MPI_Comm_Size, MPI_Comm_rank,MPI_Send,MPI_Recv;Message Passing Routines, Point-to-Point, Collective Communication

UNIT III **9 Hours**

PERFORMANCE MEASURES

Granularity, Speed Up, Efficiency, Cost, Amdahls Law, Gustafsons Law, and Isoefficiency; Analysis of ParallelPrograms: Parallel Computation Models, PRAM, and Modeling Communication

UNIT IV **9 Hours**

PARALLEL COMPUTATIONS

Low Level Image Processing, Mandelbrot Set, Monte Carlo Methods; Simple Data Partitioning: Sum of Numbers, Bucket Sort, Numerical Integartion, N-Body Problem; Divide-and-Conquer: Sum of Numbers, Merge Sort, Adaptive Quadrature, Barnes-Hut Algorithm; Pipelined Computations: Type 1, 2 and 3 Pipelines.

UNIT V **9 Hours**

SCHEDULING AND LOAD BALANCING

List Scheduling, Static Load Balancing, Dynamic Load Balancing, Moores Algorithm Synchronous Computations, Data Parallel Programming, Global and Local Synchronization.

FOR FURTHER READING

Case Studies - Boundary Value Problem, finding the maximum n-body problem. Built in Schedulers - Cron Unix Built in Scheduler, Windows Task Scheduler, Visual Cron

Total: 45 Hours

Reference(s)

1. Michael J.Quinn , Parallel Programming in C with MPI and OpenMP, McGraw Hill (2012).
2. Wilkinson Barry and Michael Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers,Second Edition, Prentice Hall Inc, 2009.
3. A. Grama, A. Gupta, G. Karypis and V. Kumar. Introduction to Parallel Computing, Second Edition,Addison. (2003)
4. Wesley (2009).David Culler, J.P. Singh,Parallel Computer Architecture: A Hardware/Software Approach , Morgan Kaufmann Publishers (2011).

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	6			2	6								2											20
2		2	2			6				2					8										20
3	2	2					4			2				2	4			4							20
4		2	2				6								6								4		20
5		2			2	2			1	1			2	2	4							4			20
Total																									100

Assessment Questions

Remember

1. Define Parallel Processing.
2. Explain Pipelined processor in detail.
3. List theÂ Various parallel programming models.
4. Explain loop splitting.
5. What is Granularity?
6. What is speedup?
7. What is race condition?
8. What is thread?
9. Explain Parallel Reduction technique.
10. Explain mutex

Understand

1. Discuss classification of parallel computers.
2. Explain Parallel algorithm for bubble sort.
3. Discuss General Model Of Shared Memory Programming.
4. Explain Parallel Sorting Algorithms.
5. Explain Barriers in parallel computing.
6. Explain forward dependency .Also explain how to overcome it.
7. Explain Condition variable using pthread example.
8. What is speedup? Differentiate Ideal speedup v/s True speedup.
9. Explain basic parallel programming techniques.
10. Explain loop splitting with example.

Apply

1. What is Granularity? Explain effect of granularity on parallel processing
2. Classify parallel computers based on Flynn’s Taxonomy
3. Explain about RPC in detail and also explain normal procedure call v/s remote Procedure call
4. Give comparison of Temporal and Data parallel processing.
5. Why is a memory hierarchy needed?
6. Define anti dependence and output dependence with respect to parallelism and dependence relations.
7. In parallel computing, what are shared memory-multiprocessors and distributed-memory multicomputers?
8. What scalability metrics affect the scalability of a computer system for a given application?
9. Define any four scalability merits for an application.
10. What are macrotasking, microtasking and autotasking levels of multitasking employed for parallel execution on Cray X-MP or Y-MP multiprocessors?

Analyse

1. Explain advantages and disadvantages of parallel processing.
2. Compare explicit and implicit parallelism. Explain methods of explicit parallelism.
3. compare shared memory v/s Dynamic memory programming model.
4. Compare Dynamic memory model v/s Message passing model.

5. Discuss Analysis Of Parallel Algorithms
6. Enlist various types of parallelism and explain any one in detail also compare the types of parallelism.

Evaluate

1. Explain JAVA threads with Example
2. Explain about DCE Directory service and DCE Time service
3. Write about the support from os in multiprocessing. Also list and explain types of Operating system for parallel machine.
4. Give comparison of Temporal and Data parallel processing.
5. Give comparison of Temporal and Data parallel processing.

Create

1. Discuss how the instruction set, compiler technology. CPU implementation and control, cache and memory hierarchy affects CPU performance. Justify their effects in terms of program length, clock rate and effective cycles per instruction**.**
2. Design a pipe line multiplier to multiply a stream of input numbers X0, X2, X3.... by a fixed number Y. Assume all X's and Y's are 16 bit numbers. Draw a neat schematic diagram of your design

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT006 BIG DATA ANALYTICS 3 0 0 3

Course Objectives

- Learn advanced cutting edge and state-of-the-art knowledge and implementation in big data
- Familiarize with Predictive Analytics
- Explore the next generation of big data management frameworks and Visualization tools

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. Analyze the issues in conventional systems and perform a comparative study on the Big Data Analytical tools and statistical concepts.
2. Apply statistical methods to create predictive models and interpret such models to support fact-based decision making.
3. Perform data analytics using R to solve Big Data problems (derive value from vast data sets).
4. Collect, store, query and manage various forms of Bigdata using Hadoop and Mapreduce programming model.
5. Analyze the NoSQL Big Data management systems, store and query data using Mongodb and apply the Visual Techniques for Bigdata Visualization.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	1	-										
2	2	2	2	-	-		-							
3	2	2	2		-									
4	1	2	2		-									
5	1	2	3											

UNIT I **9 Hors**

INTRODUCTION TO BIG DATA

Introduction to BigData Platform - Traits of Big data - Challenges of Conventional Systems - Web Data - Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting -

Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error

UNIT II **9 Hours**

PREDICTIVE ANALYTICS

Predictive Analysis: Regression Analysis - Multivariate Analysis - Multicollinearity - Correlation analysis- Rank correlation coefficient - Multiple correlation - Least square - Curve fitting and good ness of fit.

UNIT III **9 Hours**

DATA ANALYTICS USING R

Installing R - The R Basics: Variables -Data Types -Vectors - manipulating objects: arrays -matrices Ã¢?? lists and data frames - reading data from files - data distribution: probability distributions - Simple Linear Regression - Basic Sentiment Analysis- Basic Analysis Techniques: Chi-Square test - T-test- ANOVA.

UNIT IV **9 Hours**

HADOOP AND MAPREDUCE

Hadoop Architecture- Hadoop Storage: HDFS- Common Hadoop Shell commands - Anatomy of File Write and Read - NameNode - Secondary NameNode and DataNode - Hadoop MapReduce Paradigm - Map and Reduce tasks Ã¢?? Job - Task trackers - Cluster Setup Ã¢?? SSH and Hadoop Configuration.

UNIT V **9 Hours**

NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION

NoSQL Databases : Schema-less Models- Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Column Stores -Graph Databases - Mongodb basic commands: Create - Read - Update - Delete operations - Replicate Ã¢?? Sharding - Visualizations: Visual Data Analysis Techniques using R: 3D plotting, Histograms, Multi-Ã‚Â¬panel plotting, Boxplots, ggplot2.

FOR FURTHER READING

SVM, Hive, Pig, Spark, Hbase, Zookeeper

Total: 45 Hours

Reference(s)

1. Michael Berthold, David J Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012
3. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons, 2012.
4. Glenn J Myatt, Making Sense of Data, John Wiley & Sons, 2007
5. Jason Bell, Machine Learning for Big Data, Wiley Publications, 2016.
6. Jiawei Han, MichelineKamber, Data Mining Concepts and Techniques, Second Edition, Elsevier, Reprinted 2008.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2		3			2				3	2		4												16
2	3	2				2	4		4	5				4	3			2							29

3		2				3	4		4	2	3			5	3			3						29
4			4		2					7					3									16
5					4						6													10
Total																								100

Assessment Questions

Remember

1. Define the drivers for Big Data-Velocity, Variety, and Veracity
2. Write at least four Big Data Analytics Applications in detail.
3. What technologies support Big Data analysis?
4. What is the recommended best practice for managing big data analytics programs?
5. What is the name of the programming framework originally developed by Google that supports the development of applications for processing large data sets in a distributed computing environment?
6. What makes Big Data Analytics different from analysing a big database?
7. What is the context for global and regional coordination by the official statistical community in the collection and dissemination of best practices in statistical information management for the scalable storage, mining and
   analysis of Big Data?
8. Define Four V's of Big Data
9. What is Apache Hive?
10. Define PIG.

Understand

1. Explain Big data and Hadoop open source technologies.
2. Write a brief note on composing map-reduce calculations.
3. Explain about the Hadoop Input and Output and write a note on data integrity.
4. Illustrate the design of Hadoop distributed file system(HDFS).
5. Explain Massively Parallel Processing (MPP) Platforms architecture in detail.
6. Define Unstructured Data Analytics. Elaborate on Context-Sensitive and Domain-Specific Searches.
7. Explain Map-reduce framework in detail. Draw the architectural diagram for Physical Organization of Compute Nodes
8. Define HDFS. Explain HDFS in detail
9. What is Complexity Theory for Map-Reduce? What is Reducer Size and Replication Rate?
10. Write Short notes on the following
    a) Stream Data Model & Stream Queries
    b) Graph Model and Mapping Schemas
    c) Knowledge Hubs and Authorities
11. Is Big Data the tipping point to move from maintaining a proprietary database to processing in the Cloud?
12. How secure is a Cloud environment for storing confidential data?

Apply

1. How Big Data Analytics is Implemented? Expalin
2. An online retailer wants to study the purchase behaviors of its customers. What would be your recommendation to enhance the plot to detect more structures that otherwise might be missed?
3. Suppose everyone who visits a retail website gets one promotional offer or no promotion at all. We want to see if making a promotional offer makes a difference. What statistical method would you recommend for this analysis?
4. A local retailer has a database that stores 10,000 transactions of last summer. After analyzing the data,
   a data science team has identified the following statistics:
   ? {battery} appears in 6,000 transactions.
   ? {sunscreen} appears in 5,000 transactions.

? {sandals} appears in 4,000 transactions.
? {bowls} appears in 2,000 transactions.
? {battery,sunscreen} appears in 1,500 transactions.
? {battery,sandals} appears in 1,000 transactions.
? {battery,bowls} appears in 250 transactions.
? {battery,sunscreen,sandals} appears in 600 transactions.
Answer the following questions:
a. What are the support values of the preceding itemsets?
b. Assuming the minimum support is 0.05, which itemsets are considered frequent?
c. What are the confidence values of {battery}→{sunscreen} and {battery,sunscreen}→{sandals}? Which of the two rules is more interesting?
d. List all the candidate rules that can be formed from the statistics. Which rules are considered interesting at the minimum confidence 0.25? Out of these interesting rules, which rule is considered the most useful (that is, least coincidental)?

5. Research and document additional use cases and actual implementations for Hadoop
6. Use MapReduce in Hadoop to perform a word count on the specified dataset.
7. Use Pig to perform a word count on the specified dataset
8. Use Hive to perform a word count on the specified dataset.
9. From a SQL table or query, randomly select 10% of the rows. Hint: Most SQL implementations have a random() function that provides a uniform random number between 0 and 1. Discuss possible reasons to randomly sample records from a SQL table.
10. As part of operationalizing an analytics project, which deliverable would you expect to provide to a Business Intelligence analyst?

Analyse

1. Are statistical offices in developing countries able to leapfrog the modernization of statistical products and processes in a contractual services environment while working with advanced statistical offices in meeting the new challenges in Big Data?
2. How do we introduce a change in the official statistical community at global,regional and national level to rethink and to innovate our statistical products and processes for official statistics with the advent of Big Data?
3. Analyze the key skill sets and behavioral characteristics of a data scientist.
4. In which phase would the team expect to invest most of the project time? Why? Where would the team expect to spend the least time?
5. What are the benefits of doing a pilot program before a full-scale rollout of a new analytical methodology?
   Discuss this in the context of the mini case study.
6. If a graph of data is skewed and all the data is positive, what mathematical technique may be used to help detect structures that might otherwise be overlooked?
7. Compare and contrast five clustering algorithms, assigned by the instructor or selected by the student
8. Compare and contrast Hadoop, Pig, Hive, and HBase. List strengths and weaknesses of each tool set.
   Research and summarize three published use cases for each tool set.
9. Describe four common deliverables for an analytics project.Justify
10. Differentiate BI and Data Science

Create

1. Why it is better to have a big database for data mining?
2. If your company is just starting to consider using Big Data in marketing research, what would be most useful to include?

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT007 DISASTER MANAGEMENT 3 0 0 3

Course Objectives

- understand the Principles and Components of Disaster Management in IT Infrastructure.
- learn the Design Considerations when Planning for Business Continuity and Disaster Recovery.
- study the VM Business Continuity and Disaster Recovery Solutions.

Programme Outcomes (POs)

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Identify the different types, causes and hazards of various disasters
2. Analyze the various methods to mitigate the effect due to disasters.
3. provide the Network Infrastructure Solutions for BC.
4. Design and implementation of BCDR Solutions
5. Plan the Network Infrastructure Solutions for BCDR

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2			2									
2					3		2							
3						3					2			
4			3		2	2								
5			2										1	

UNIT I **9 Hours**

DISASTER MANAGEMENT AND PLANNING

Concept of Disaster, Causes and Types of Disasters,Natural and Anthropogenic Disasters, Principles and Components of Disaster Management, Nature, Scope and Management Process, SWOT Analysis,

Hazard and Vulnerability Analysis, Identifying Crisis Situations, Group Dynamics, Team-Building in Disaster Management.

UNIT II **9 Hours**

DISASTER MANAGEMENT CYCLE

Disaster Mitigation,Risk reduction,Prevention,Preparedness,Response,Recovery - Importance of Information and Communication in Disaster Mitigation, Hazard mapping and forecasting,Strengthening Capacity for Reducing Risk, Role of Team and Coordination, Sustainable Development for Disaster Mitigation.

UNIT III **9 Hours**

IT BUSINESS CONTINUITY AND DISASTER RECOVERY

Typical BCDR planning workflow process - Design Considerations when Planning for BCDR: Network Address Space, Datacenter Connectivity, Storage Infrastructure, VirtualCenter Infrastructure, VMware ESX Host Infrastructure - Virtual Machines as a Foundation for BCDR: Virtual Infrastructure, Virtualization Platforms, Leveraging Virtual Infrastructure for BCDR.

UNIT IV **9 Hours**

DESIGN AND IMPLEMENTATION BCDR SOLUTION

High-Level Design Considerations - Typical Configuration: Granularity of failover, Replication, Resource management, Namespace mapping, VI Networking - VM BCDR Solution: Design Considerations, VirtualCenter Design, Protection Groups and VirtualCenter,

UNIT V **9 Hours**

ADVANCED AND ALTERNATIVE BCDR SOLUTIONS

Work Area Recovery ÃƒÂ¢?? Physical to Virtual BCDR - Network Infrastructure Solutions: Fixed IP Addresses, Changing IP Addresses, Storage Connectivity, Storage Multipathing and Path Failover - SAN Zoning.

FOR FURTHER READING

Sahana Disaster Management System, Tsunami Early Warning System, UNOSAT's Role in Disaster Response,

Total: 45 Hours

Reference(s)

1. Dr. Mrinalini Pandey Disaster Management, wiley india pvt ltd 2014
2. Disaster Management in India, Ministry of Home Affairs, Government of India, New Delhi, 2011.
3. National Policy on Disaster Management, NDMA, New Delhi, 2009.
4. A Practical Guide to Business Continuity and Disaster Recovery with VMware Infrastructure, VM Books - VMware, Inc.
5. Chuck Edwards Business Continuity Planning: Disaster Recovery in the Cloud, Blog: Cloud Computing Featured Posts in Datavail Corporation.
6. Chakrabarty, U. K. Industrial Disaster Management and Emergency Response, Asian Books Pvt. Ltd., New Delhi 2007.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2		2			2			1	2				4	2										15
2		2			1		3		2	2	2			2	2			4							20

3			4			2	4			4				2	4				2					22
4		2				2	2				4		3		4				4					21
5	1	1			2		4			4				2	4			2				2		22
Total																								100

Assessment Questions

Remember

1. ListÂ 2 types of Disasters.
2. Define the termÂ Anthropogenic Disasters.
3. Name the 6 components of disaster management cycle.
4. DefineÂ Network Address Space.
5. list the advantages of Hazard mapping.
6. Name the 2 types ofÂ Replication techniques.
7. What is the use of dynamic IP in computer networks?
8. List 4 advantages of VMware ESX Hosts.
9. DefineÂ SAN Zoning.
10. What isÂ Storage Multipathing?

Understand

1. Explain the concepts ofÂ Natural and Anthropogenic Disasters.
2. Explain in detail about the differentÂ Components of Disaster Management.
3. Sketch and explain the components ofÂ disaster management cycle.
4. What was the main Role of Team and Coordination in DS?
5. Classify the components of VirtualCenter Infrastructure.
6. Explain the 3 types of storage techniques inÂ Datacenter.
7. Give an example for Storage Virtualization at Different Layers.
8. Describe the network visualization techniques in Datacenter.
9. Summarize the concept of block level virtualization technique.
10. Explain the various virtualization methods along with their benefits and considerations.

Apply

1. can you do theÂ Vulnerability Analysis in DS?
2. Cloud architectures designed for service delivery and availability of services are extremely important. How do you handleÂ the software failure within a cloud infrastructure environment using virtualization techniques?
3. A company is considering a cloud environment to improve the operating efficiency for their data and applications. The company is part of an industry where strict security and data privacy issues are of the highest importance. Illustrate how the virtual datacenter offers data security.
4. Draw the working flow of remote replication in cloud.
5. A company is setting up a cloud environment to host several of their applications. These applications vary in importance and the company wants to ensure that the most business critical applications get the most resource. Show the benifits of VMware BCDR for this company.
6. Illustrate the 2 traditional approaches for taking backup in VDC.
7. Show the procedure to restore the backup data in a virtual machine?
8. Illustrate the steps involved inÂ SAN Zoning process inÂ BCDR**.**
9. Draw the Storage MultipathÂ architecture forÂ alternative bcdr solutions.
10. Illustrate the concept ofÂ VMware ESX Host Infrastructure.

Analyse

1. Compare and contrast theÂ Fixed IP Addresses and Changing IP Addresses .
2. Classify the two types ofÂ Disaster.
3. What are the pros and cons ofÂ SWOT Analysis?
4. Differenciate between RTO and RPO in Datacenter management.
5. Do you use a third-party datacenter (rented space) or a dedicated facility that you own andÂ operate?

6. Classify the data centers according to the applications. With a line sketch and a suitable application example, explain the features of each type.
7. Differenciate between local replication and remote replication.
8. Differenciate betweenÂ service failover and failback.

Evaluate

1. What level of granularity are you looking to achieve in a disaster situation?
2. is there a better solution to broadcast theÂ Disaster messages in ICT?

Create

1. A software concern would like to leverage cloud computing to provide advanced collaboration services (i.e. video, chat, and web conferences) for its employees but does not have the IT resources to deploy such an infrastructure. Design a virtual network infrastructure for this company.
2. Design an efficientÂ Disaster Mitigation system for software company.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT008 MANAGEMENT INFORMATION SYSTEMS 3 0 0 3

Course Objectives

- Interpret the systematic knowledge of the management Information System used in the organization to facilitate the decision making.
- Determine the various Information System solutions like ERP, CRM, GIS,AI,CSD and the benefits in implementation of these technology in the oganization.
- Analyze the need for system analysis and design in the development of Management Information System.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Classify the Objective and Processes in Developing an Information System Development and explain the role of Management Information Systems in achieving business competitive advantage through informed decision-making.
2. Analyze the Decision making Methods, Tools and Procedures involved in the process of conducting the business to achieve its objectives.
3. Infer the need for system Analysis and analyze the system development models, plans developed for organization development process.
4. Interpret the different decision support systems used in the organization to facilitate decision-making.
5. Explain the impact of the Internet technology on business-electronic commerce and electronic business.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1											
2			2					1	2		1			
3		1	2	1	2									
4	1						2				1			
5					2						2		1	

UNIT I **9 Hours**

INFORMATION SYSTEM AND ORGANIZATION

Matching the Information System Plan to the Organizational Strategic Plan-Identifying Key Organizational Objective and Processes and Developing an Information System Development-Technology of Information Systems- Concepts-Definition - Role and impact of MIS - Role and importance of management-Approaches to Management - Functions of the manager - Management as a control system

UNIT II **9 Hours**

DECISION MAKING AND INFORMATION

Decision making concepts - Methods- Tools and Procedures - Behavioral concepts in Decision making - Organizational Decision Making - Information concepts as a quality Product - Classification of the information - Methods of Data and information Collection - Value of the information - Human as a information Processor - Organization and Information.

UNIT III **9 Hours**

SYSTEM ANALYSIS AND DESIGN

Systems Development Life Cycle-CASE Tools - Object Oriented Systems-System analysis and design-Need for system Analysis - System Analysis of existing System - New Requirement - System Development Model - Structured Systems Analysis and Design - Computer System Design - Development of MIS - Development of long Range plans of the MIS - Ascertaining the class of information

UNIT IV **9 Hours**

DECISION SUPPORT SYSTEMS

Decision Support Systems - Business Intelligence and Analytics - Group Decision Support Systems - Executive Information Systems - Executive Support Systems - Geographical Information Systems - Artificial Intelligence- Deterministic systems- Knowledge Based Expert System MIS and the role of DSS - Enterprise management systems - EMS - Enterprise Resource Planning (ERP) system -ERP basic features - Benefits - Selection - Implementation

UNIT V **9 Hours**

CURRENT TRENDS

Knowledge management -Networks - Internet and Web based Information System - Electronic Commerce - Electronic Business - Commercial applications

FOR FURTHER READING

Management by exception- Organization structure and Theory System concepts Control Types - Handling System Complexity

Total: 45 Hours

Reference(s)

1. George M Marakas, James A O'Brien ,Management Information Systems (English, Mcgraw Hill Education,10th Edition 2013
2. W S Jawadekar,Management Information Systems, Tata McGraw Hill Publishing Company Limited 2008
3. Kenneth C Laudon, Jane P Laudon ,Mary E Brabston ,Management Information Systems - Managing the Digital Firm,Fourth Canadian Edition, Pearson Prentice Hall,2008
4. www.Gisdevelopment.net/policy/gii/gii0022b.html
5. http://catalogs.mhhe.com/mhhe/viewProductDetails.do isbn=0072456655
6. Applegate,Lynda M et al,Corporate Information Strategy and Management: Text and Cases,McGraw-Hill, 2003

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2		3			2				3	2		4												16
2	3	2				2	4		4	5				4	3			2							29
3		2				3	4		4	2	3			5	3			3							29
4			4		2					7					3										16
5					4						6														10
Total																									100

Assessment Questions

Remember

1. Define MIS
2. Enlict the characteristics of control process
3. Using examples compare and contrast expert system and DSS
4. Explain the methods used for designing structured programs
5. Illustrate the merits and demerits of System audit
6. A person machine-system and a highly integrated grouping of information-processing functions designed to provide management with a comprehensive picture of specific operation is called---------
7. Describe THREE levels of management and explain the differing information requirements at each level.
8. Describe knowledge-based systems and explain how such systems could be implemented.
9. Explain how the knowledge-based system should be tested
10. Elucidate the main features of a workflow system.

Understand

1. What do you mean by Structural methodologies
2. Describe the necessity of information in the management of organisations
3. Name and describe the principle controls for a computerized systems
4. For EACH of the following MIS development approaches, provide an overview of the approach and explain to which MIS development situations the approach is most suited.
   i) Traditional approach.
   ii) Evolutionary approach.
   iii) Phased approach.
5. For EACH of the following MIS development approaches, provide an overview of the approach and explain to which MIS development situations the approach is most suited.
   i) Traditional approach.
   ii) Evolutionary approach.
   iii) Phased approach.

6. Explain, with the aid of suitable examples, the role of a digital dashboard in supporting management control activities.
7. Service Sector is also called ----------
8. Describe and justify THREE characteristics of quality management information
9. Scalability is a key issue to consider within BI systems development - Explain
10. Discuss the prerequisites of successful end-user computing and comment on how the success of such systems could be measured

Apply

1. With the aid of suitable examples, describe the ways in which the Internet can enable MIS provision.
2. Illustrate the various MIS technologies that could be used to create a virtual organisation.
3. Illustrate the advantages and disadvantages of a manager being the direct user of an OLAP tool rather than providing an intermediary to operate the OLAP tool on behalf of the manager
4. A food producing company wants to make different decisions regarding the production process whenever these are required. Specifically, they want to be able to effectively answer questions such as “If one of the production process machines breaks down, what is the effect on the company’s ability to satisfy customer demand for our products?” and “If we add an additional shift to our daily work schedule on one of our production process machines, what impact would this have on our throughput per day?”.
5. Critically analyse both the traditional and the Rapid Application Development(RAD) approaches to the development of Management Information Systems
6. Discuss and justify which of theÂ development approaches, traditional or RAD you would recommend forÂ following situation:
   An insurance company which requires an accounting system to process and record the collection of premiums obtained from customers’ bank accounts
7. “Wearable technology will have as big an impact on Management Information Systems as did the introduction of the personal computer.”
8. Develop a MIS for a manufacturing organization indicating the different types of information subsystems depending on functional areas. High light the flow of information and the corresponding levels of information. What are the types of reports the system would generate.
9. Why Cost Benefit Analysis is carried out?
10. Why Quality Control is necessary is Information System Design?

Analyse

1. How Decision Support System will help MIS Manager in the cost benifit analysis system
2. "Structural analysis is an important step and a vital role for system analysis".Highlights its impact on the outcome of cost / benefit analysis.
3. Give an examples of how information systems can support the five functions of management
4. Which one of the following is not an important characteristic of useful and effective information ?
5. The most important reason for failure of MIS is ----------
6. The finance manager of a local company wishes to develop his own spreadsheet-based Decision Support System (DSS) that will help determine the financial feasibility of any potential project the organisation is considering. Discuss the benefits and potential problems that might arise as a result of the DSS being developed by the finance manager.
7. The company’s auditors have concerns that information held by the virtual company would lack security. List and describe FIVE measures that could be adopted to ensure this information remains secure
8. Using examples, explain how a combination of document management systems and workflow systems could improve productivity in the large organisation
9. The involvement of user staff and MIS staff in all the development stages, from initial system request to post implementation review is required – JUSTIFY

Evaluate

1. In the context of MIS, describe each of the following applications and evaluate their benefits.
   a) Data warehousing
   b) Customer Relationships Management (CRM) systems
   c) Enterprise Resource Planning (ERP) systems

Create

1. "An analyst must posses various skills to effectively carry out the job".Elucidate the statement from the view point of skills required for the system analyst
2. Paradigm shift to pervasive computing is likely to create new oppurtunites and challenges for information technologies - Discuss

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT009 NATURAL LANGUAGE PROCESSING 3 0 0 3

Course Objectives

- understand the representation and processing of Morphology and Part-of Speech Taggers
- express different aspects of natural language syntax and the various methods used for processing syntax
- know about various applications of natural language processing

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Apply the probability basics and construct the N-gram language model
2. implement a rule based system to tackle morphology/syntax of a language
3. Design a Grammar, parser, statistical parser and tree-bank for given language
4. Analyze the semantic of language through supervised and un-supervised learning method.
5. design an innovative application using NLP components

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	2	-									1	1
2	2	2	2										2	2
3	3	2	3			-							2	2
4	3	2	3										2	2
5	3	2	2										2	2

UNIT I **8 Hours**

INTRODUCTION

Natural Language Processing tasks in syntax, semantics, and pragmatics -Issues - Applications - The role of machine learning - Probability Basics -Information theory - Collocations -N-gram Language Models - Estimating parameters and smoothing - Evaluating language models.

UNIT II **9 Hours**

MORPHOLOGY AND PART OF SPEECH TAGGING

Linguistic essentials - Lexical syntax- Morphology and Finite State Transducers - Part of speech Tagging - Rule-Based Part of Speech Tagging - Markov Models - Hidden Markov Models - Transformation based Models - Maximum Entropy Models. Conditional Random Fields.

UNIT III **10 Hours**

SYNTAX PARSING

Syntax Parsing - Grammar formalisms and treebanks - Parsing with Context Free Grammars - Features and Unification -Statistical parsing and probabilistic CFGs (PCFGs)-Lexicalized PCFGs.

UNIT IV **10 Hours**

SEMANTIC ANALYSIS

Representing Meaning - Semantic Analysis - Lexical semantics - Word-sense disambiguation - Supervised - Dictionary based and Unsupervised Approaches - Compositional semantics- Semantic Role Labeling and Semantic Parsing - Discourse Analysis.

UNIT V **8 Hours**

APPLICATIONS

Named entity recognition and relation extraction- Information Extraction (IE) using sequence labeling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment-phrase-based translation - Question Answering- VXML Applications.

FOR FURTHER READING

Document Classification Text Search - Speech based Authentication.

Total: 45 Hours

Reference(s)

1. Daniel Jurafsky and James H. Martin "Speech and Language Processing", Second Edition, Prentice Hall, 2014.
2. Christopher D. Manning and Hinrich Schuetze, "Foundations of Statistical Natural Language Processing", MIT Press, 2014.
3. Roland R. Hausser, "Foundations of Computational Linguistics: Human- Computer Communication in Natural Language", Springer, 2014.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2				2	12								2											18
2		2					2				12							6							22
3	2					2																	12		16
4		2				2								12				6							22
5		2				2				12					6										22
Total																									100

Assessment Questions

Remember

1. Provide two examples of lexical gaps relative to language pairs of your choice.
2. Give four examples each of transitive verbs and intransitive verbs.
3. State an algebraic definition of PS-grammar.

4. Name two different reasons why an LA-parser may stop the analysis before reaching the end of the input.
5. By which method is the proper inclusion of the type-3 language class in the type-2 language class and that of the type-2 language class in the type-0 language class formally proven in PS-grammar?
6. Give the inflectional paradigms of man, power, learn, give, fast and good. Generate new words from them (derivation) and combine them into meaningful new words (composition).
7. Describe the LA-derivations of "John gave Mary Susy, the boy gave the mother the child, and the big boy gave the young mother the hungry child", and give detailed explanations of the pattern matching and the categorial operations of the rules involved.
8. Define speech processing and language processing.
9. State the term regular expression?
10. Define transformation-based tagging.

Understand

1. Explain the procedure to construct the context free grammar and parse tree for the English language.
2. Illustrate finite state morphological parsing for the following sentence “The Porter algorithm is a simple and efficient way to do stemming, stripping off affixes.”
3. Discuss the Information retrieval and word sense disambiguation process for the Airline corpus.
4. Describe how Yarowsky's algorithm for word sense disambiguation would process the example texts. Illustrate each stage of the algorithm with an example.
5. In what sense is the interaction with a contemporary washing machine a special case of man-machine communication, and why is it not essential to computational linguistics?
6. It is sometimes pointed out that English has no word corresponding to the German word Schadenfreude. Does this mean in your opinion that the corresponding concept is alien to speakers of English and cannot be expressed?
7. Rather than simply parsing a sequence of words, if interfacing a parser to a speech recognizer, one often wants to be able to parse a word lattice. Extend a PCFG parser so it works with word lattices.
8. Explain the relation between special types of PS-grammar, formal language classes and different degrees of complexity.
9. Demonstrate with an example that the derivation order to PS-grammar is incompatible with the time-linear structure of natural language.
10. Do left-associative combi-rules show a difference in the combination of a prefix and a stem, on the one hand, and a word start and a suffix, on the other? Illustrate your answer with the example un/du/ly.

Apply

1. Write a program that takes a word and using an on-line dictionary, computes possible anagrams of the word.
2. Design the Transformation Based Learning algorithm. Create a small number of templates and train the tagger on any Part of Speech tagged training set you can find.
3. Using the list approach to representing a verb's sub categorization frame, show how a grammar could handle any number of verb sub categorization frames with only the following VP rules. More specifically, show the constraints that would have to be added to these rules to make this work
   VP --> Verb
   VP -->VP X
4. Implement the PARSEVAL metrics, use either treebank or create your own hand checked parsed testset.Use your Context Free Grammar parser and grammar and parse the testset and compute labeled recall, labeled precision, and cross-brackets.
5. Using a phrasal search on your favorite web search engine, collect a small corpus of *the tip of the iceberg* examples. Be certain that you search for an appropriate range of examples. Implement and analyze using Earley-baased semantic analyzer.

6. The following context-free grammar (CFG) accepts sequences of part-of-speech categories (e.g., Det N, Adj Adj N). With a lexicon, as shown, it can be used to parse some English noun phrases (NPs).
   Start symbol: NP a, the: Det
   NP -> Det N dog, dogs, house,
   NP -> N houses, model, models: N
   N -> Adj N brown, red, model: Adj
   N -> N PP in, under: P
   PP -> P NP
   Give a non-deterministic nite-state automaton (NDFSA) which accepts thesame sequences of part-of-speech categories as this CFG. Explain the notation that you use.
7. Write a regular expression that will identify male and female names in context, in an English-language text. Discuss ways in which this might over- or under-generate.
8. How will you create the actual algorithm for HMM tagging?
9. Demonstrate with an example for parsing with unification constraints.
10. How to tell if a language is not regular? Explain a machine with N states accepting a string xyz of N symbols.

Analyse

1. Compare three different approaches to language analysis and describe their different methods, goals, and applications.
2. Compare the description of natural visual pattern recognition with electronic models . Bring out differences on the level of hardware and common properties on the logical level between the two types of system.
3. Differentiate between non-deterministic finite-state automaton and deterministic finite-state automaton.
4. Explain the difference between regular and context-free grammars and discuss the claim that natural language grammars need at least context-free power.
5. Suppose the following lists show the number of sentences and the most commonly occurring part-of-speech tags in three different categories of text in a corpus, with their frequency of occurrence in brackets. What can you say about the styles of these documents from studying these results? Discuss any assumptions you make.

Evaluate

1. Consider a domain where the word coffee can refer to the following concepts in a knowledge-base: a caffeinated or decaffeinated beverage, ground coffee used to make either kind of beverage, and the beans themselves. Give arguments as to which of the following uses of coffee are ambiguous and which are vague.
   a. I’ve had my coffee for today.
   b. Buy some coffee on your way home.
   c. Please grind some more coffee.
2. Select a restricted sublanguage and build either a systemic or FUF generation grammar for it. The sublanguage should be subset of a restricted domain such as weather reports, instructions, or responses to simple inquires.
3. Show that the KL divergence is not symmetric by finding an example of two distributions p and q for which D(p II q) + D(q II p).
4. Esperanto is an artificial language that was invented by Ludwig Zamenhof in 1887. It was designed to be easy to learn and is based largely on the languages of western Europe. It is now primarily spoken in France, although it may also be found in eastern Asia, South America and eastern Europe. There are now between 200-2,000 native speakers and about 2,000,000 people worldwide speak it as a second language. Examine the following data from Esperanto and then answer the questions below:
   1. bono ‘goodness’
   2. instrua ‘instructive’
   3. malfacila ‘difficult’
   4. patrino ‘mother’
   5. instruisto ‘teacher’

6. porti ‘to carry’
7. facila ‘easy’
8. patro ‘father’
9. portisto ‘porter’
10. instrui ‘to instruct’

5. Apply the n-gram and Brill tagging methods to IOB chunk tagging. Instead of assigning POS tags to words, here we will assign IOB tags to the POS tags. E.g., if the tag DT (determiner) often occurs at the start of a chunk, it will be tagged B (begin). Evaluate the performance of these chunking methods relative to the regular expression chunking methods covered in this chapter.

Create

1. For each word below, draw a word tree.
   1. shipper
   2. disobey
   3. resettled
   4. anticlimaxes
   5. unemployment
   6. simply
   7. jumping
   8. digitizes
   9. activity
   10. confrontational
2. Modify the grammar so that it generates the unstarred sentences below. Justify your modifications.
   i. Oscar died in Paris.
   ii. Oscar died in a hotel in Paris.
   iii. The waiter came to the table when Oscar called him.
   iv. When Oscar called him the waiter came to the table.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT010 DIGITAL IMAGE PROCESSING 3 0 0 3

Course Objectives

- Study the fundamentals of Image and transforms for performing image processing.
- Apply the techniques of image enhancement, restoration and colour models.
- Understand the methods of image compression and segmentation.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Apply image transforms to extract the features / coefficients from the image
2. Analyze suitable smoothing and sharpening filters to enhance the quality of an image.
3. Examine the performances of denoising techniques to restore the image based on noise models and construct an algorithm for color code conversion algorithms.
4. Analyze the performance of Compression techniques over an image
5. Apply segmentation techniques to extract edges and represent boundaries and regions in the images

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1		1							-		
2	3	3	1		1							-		
3	2	3	1		1							-		
4	3	2	2	1	2							-		
5	3	2	2	1	2							-		

UNIT I **9 Hours**

IMAGE TRANSFORMS

Components of an Image Processing - Image sampling and quantization - Relationship between pixels: neighbours, Adjacency, connectivity, Regions and boundaries, Distance measures, Image Transforms: Discrete Fourier Transform (DFT)- - Discrete Cosine Transform (DCT)- Karhunen-Loeve ransform(KLT) - Singular Value Decomposition (SVD)-Walsh transform - Hadamard Transform and Harr Transform

UNIT II **9 Hours**

IMAGE ENHANCEMENT

Image enhancement in Spatial Domain - Point operation, types of point operation, Histogram Manipulation, Linear and non linear gray-level transformation, Local or Neighborhood operation - Mean Filter, Median Filter, weighted average Filter, Bartlett Filter, Gaussian Filter, Spatial filtering: Smoothing, sharpening filters - Laplacian filters, Frequency domain filters: Smoothing-Low-pass filters, butterworth lowpass filter, Gaussian Low-pass Filter, Sharpening filters. High-Pass Filters, Butterworth-high Highpass Filter, Gaussian High-pass Filter.

UNIT III **9 Hours**

IMAGE RESTORATION AND COLOR MODELS

Model of Image Degradation/restoration process - Noise models - Inverse filtering -Least mean square error (Wiener) filtering, Constrained least mean square filtering - Color fundamental, RGB colour Model, CMY and CMYK Colour Models, HIS colour model, YIQ Colour Model, YCbCr Colour Model, Pseudocolor Image processing-Intensity Slicing, Intensity to Colour Transformation.

UNIT IV **9 Hours**

IMAGE COMPRESSION TECHNIQUES

Need for Image Compression - Redundancy - spatial and temporal redundancy - Classification of image-compression Schemes - Huffman Coding, LZW coding, Run Length coding, BIT plane coding, predictive coding, Image compression standards - Transform based Compression:JPEG

UNIT V **9 Hours**

IMAGE SEGMENTATION

Segmentation Fundamentals-point, line, and edge detection, The Marr-Hilderth edge detector, Canny edge detector, Region Based segmentation - region growing, region splitting and merging. Boundary representation: chain codes - Polygonal approximation - boundary descriptors: Simple descriptors-Regional

FOR FURTHER READING

Face and Finger print recognition systems based on feature extraction using supervised neural network

Total: 45 Hours

Reference(s)

1. R.C. Gonzalez & R.E. Woods, Digital Image Processing, PHI, India, 3rd Edition, 2015.
2. S.Jayaraman,S.Esakkirajan,T.Veerakumar, Digital Image Processing, McGraw Hill Education, India, 2nd Edition, 2012
3. Scott E Umbaugh, Digital Image Processing and Analysis, The CRC Press, Boca Raton, FL, 2nd Edition January 2011
4. William K. Pratt, Digital Image Processing, John Wiley, 4th Edition, 2007

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	4			2	6								2									2		20
2		2	2			6				2					8										20
3	2	2					4			2				2	6			2							20
4		2	2				6								6			4							20
5		2				4				2				4	4							4			20
Total																									100

Assessment Questions

Remember

1. State the meaning of gray level in Digitsl Image Processing.
2. List the steps involved in Digitsl Image Processing.
3. Write the properties of KL transform.
4. List the three geometric transformation
5. State the properties of unitary transform
6. Give two properties of SVD transform
7. List the three applications of transform
8. Define image subtraction
9. What is meant by masking?
10. What is maximum filter and minimum filter?

Understand

1. Explain Hadamard transformation in detail.
2. Explain in detail the different separable transforms.
3. Explain Fast Fourier Transform (FFT) in detail.
4. Discuss the properties and applications of 1)Hadamard transform II) Discrete Cosine Trnsforms.
5. Explain Haar and slash transform in detail.
6. Discuss the image smoothing filter with its model in the spatial domain
7. Explain image enhancement in the frequency domain.
8. Discuss about Constrained Least square restoration for a digital image in detail.
9. Explain image degradation model /restoration process in detail
10. Explain the schematics of image compression standard JPEG.

Apply

1. Calculate the number of bits required to store a 256 X 256 image with 32 gray levels.
2. Compare spatial and frequency Domain methods
3. Perform KL transform for the folowing Matrix
   X = [4 -2 , -1 3]
4. Find a singular value decomposition of A = [1 -2Â 3 ,Â 3 2 -1]
5. Compute the 2D Haar transform of the signal f(m,n) = [4 -1 2 3]
6. Determine whether the matrix A = 1/sqrt(2) [1 0 ,-1 1] is unitary or not.
7. Develop a MATLAB program to extract extract the 8th bit in the 8 bit image using bit plsne slicing.
8. Write a MATLAB program that performs a 2D butterworth low pass filter for a 2D image for two different cut off frequencies
9. Read an input image and perform high pass filtering in the frequency domain using matlab.
10. Read an image ,the blur the image.Then degrade the image by means of known blur.Apply the inverse filter to the blurred image and see the restored image.
11. Extract red,green,blue components for the input color image and display the results in MATLAB.Identify the max grey values for each color component.
12. Generate a tag using arithmetic coding procedure to transmit the word "INDIA"

Analyse

1. Differentiate between sampling and quantization.
2. Differentiate betweenÂ image translation and scaling
3. Differentiate between lossless and lossy compression and explain transform coding system with a neat diagram.
4. Why the restoration is called as unconstrained restoration?Justify your answer.
5. How a degradation process is modeled?
6. How cones and rods are distributed in retina?
7. How sub image size selection affects transform coding error?
8. Show that the Sobel and Prewitt masks in image give isotropic results only for horizontal and vertical edges and for edges oriented at +- 45^0, rspectively.

Evaluate

1. How the derivatives are obtained in edge detection during formulation?
2. How is line detected? Explain through the operators.

Create

1. Derive the CMY intensity transformation function Si=Kri+(1-K),i=1,2,3 for (C,M,Y) from its RGB counter part Si=Kri,i=1,2,3 for (R,G,B)
2. Show that 2D gaussian is separable while laplacian of a Gaussian operator (LOG) is not separable.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT011 UNIX INTERNALS 3 0 0 3

Course Objectives

- understand about the Operating System of Unix
- learn the concept of System calls, file system, Process management
- study the different Memory Management techniques and Input output operation of Unix Operating system

Programme Outcomes (POs)

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Course Outcomes (COs)

1. Understand the structure of Unix operating System and execute its basic commands
2. Describe system calls, buffer management and kernel functionalities in UNIX OS
3. Implement the concepts of files system and authentication process.
4. Apply memory management policies and I/O subsystems in developing Unix environment.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		2												
3		2	1											
4	1		2											

UNIT I **8 Hours**

OVERVIEW

General Overview of the System: History - System structure - User perspective - Assumptions about hardware. Introduction to the Kernel: Architecture of the UNIX operating system - Introduction to system concepts. The Buffer Cache: Buffer headers -Structure of the buffer pool - Scenarios for retrieval of a buffer - Reading and writing disk blocks

UNIT II **8 Hours**

FILE SUBSYSTEM

Internal representation of files: Inodes - Structure of a regular file - Directories - Conversion of a path name to an Inode - Super block - Inode assignment to a new file

UNIT III **10 Hours**

SYSTEM CALLS FOR THE FILE SYSTEM

Open - Read - Write - File and record locking - Adjusting the position of file I/O - Lseek - Close - File creation - Changing directory, root, owner, mode - stat and fstat - Pipes - Dup - Mounting and unmounting file systems - link - unlink

UNIT IV **10 Hours**

PROCESSES

Process states and transitions - Layout of system memory - The context of a process .Process Control : Process creation - Signals - Process termination - user id of a process -The Shell - System boot and the INIT process - Process Scheduling-algorithm - scheduling parameters

UNIT V **9 Hours**

MEMORY MANAGEMENT AND I/O

Memory Management Policies: Swapping-allocation swap space - swapping processes out - fork swap- expansion swap-swapping processes in. The I/O Subsystem: Driver Interface - Inter process communication-process tracing

FOR FURTHER READING

Allocation of disk blocks-Advantages and disadvantages of the buffer cache - Creation of special files- Invoking other programs - Streams-sockets

Total: 45 Hours

Reference(s)

1. Maurice J. Bach, The Design of the Unix Operating System, 1st Edition, Pearson Education,reprint 2015
2. Uresh Vahalia, Unix Internals The New Frontiers, Pearson Education, 2010
3. S. J. Leffler, M. K. Mckusick, M. J. .Karels and J. S. Quarterman. The Design and Implementation of the 4.4 BSD Operating System, Addison Wesley, 1996

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	4			2	6								2											18
2		2	2			6				2					8										20
3	2	2					4			2				2	6			4							22
4		2	2				6								6								4		20
5		2				4				2				4	4							4			20
Total																									100

Assessment Questions

Remember

1. How will you retrieve the properties of a file?
2. What are the contents of password file?
3. Recall binary semaphore?
4. What is the use of ping command?
5. List the major system calls used for process control in Unix
6. Enumerate the various entries in a mount table.
7. List out the various steps for context switch
8. Explain the procedure for mounting a file system in UNIX operating system.
9. Define Clist in terminal drivers.
10. Write an algorithm for opening a device in driver interface.

Understand

1. Write the usage of grep command in Unix with syntax.
2. Give a static view of process state and transitions with explanation.
3. Represent the usage of a swap device, swapping system and paging system.
4. The process control subsystem is responsible for process synchronization in Unix. Discuss the reasons along with the data structures related to it.

5. Compare the system calls : change owner and change mode.
6. Summarize an algorithm for reading a regular file in UNIX file system.
7. Elucidate the process state model for the UNIX system and the set of state transitions with the complete process state transition diagram.
8. Illustrate DUP system call using a sample code.
9. Compare and contrast the system calls : stat and fstat.
10. Discuss the page fault related to validity fault and detail all the cases when the page is faulted.

Apply

1. Â Draw the file system layout and define the fields.
2. Assume that block 2 is the beginning of the inode list and that there are 8 inodes per block, thenÂ in which disk block does inode number 8 and 9 fall?
3. Perform a copy operation by creating a new process in Unix and explain.
4. Implement the operating system primitives that can be used as building blocks to buildÂ complex programs in Unix.
5. 11 Describe the system structure of the Unix system with a neat diagrammatic representation.
6. Suppose the kernel does a delayed write of a block. What happens when another process takes that block from its hash queue from the free list?
   How would you implement the following library functions for accessing existing files in UNIX?
   (a)Â fread and *fwrite*
   (b) fopen and fclose
7. Â
8. Â
9. When opening a named pipe for reading, a process sleeps until another process opens the pipe for writing. Why? Explain why the process cannot return successfully from the *open* state and continue processing until it *reads* from the pipe, and *sleep* in the *read*.
10. Illustrate the procedure for receiving a message in system V IPC.
11. Show how the communication enhanced between the client and server using sockets in UNIX.

Analyse

1. The best hash function is one that distributes the blocks uniformly over the set of hash queues. What would be an optimal hashing function? Should a hash function use the logical device number in its calculations?
2. Show the contention between two process for a free buffer and for between three processes for a locked buffer.

Evaluate

1. How would you implement lock and unlock methods for a process executing in kernel mode?
2. Show how Dijkstra's P and V semaphore operations could be implemented with named pipes. How would you implement a conditional P operation?
3. Devise an algorithm that tracks the allocation of space on a swap device by means of a bit map instead of the maps. Compare the efficiency of two methods.
4. The Multics system contains an algorithm for sleep and wakeup with the following syntax:
   Sleep(event);
   Wakeup(event, priority);
   That is, the wakeup algorithm assigns a priority to the process it is awakening. Compare these calls to the sleep and wakeup calls in the UNIX system.
5. The algorithms for the page stealer and for the validity fault handler assume that the size of a page equals the size of a disk block. How should the algorithms be enhanced to handle the cases where the respective dsizes are not equal?
6. What is region? Attribute any 3 region system calls that are invoked by a process, one when getting hold a region, one during execution and one while relinquishing it back .
7. What is region? Attribute any 3 region system calls that are invoked by a process, one when getting hold a region, one during execution and one while relinquishing it back.
8. CritiqueÂ the algorithm for converting the path name to inode.

Create

1. If several processes contend for a buffer, the kernel guarantees that none of them sleep forever, but it does not guarantee that a process will not be starved out from use of a buffer. Redesign getblk so that a process is guaranteed eventual use of a buffer.
2. Enumerate the functions of a clock interrupt handler. Explain any 3 function along with the system calls and their data structures.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT012 MOBILE TECHNOLOGIES 3 0 0 3

Course Objectives

- Introduce wireless communication and networking principles, that support connectivity to cellular networks and wireless devices
- Understand the use of transaction principles over wireless devices to support mobile business concepts.
- Understand the working of various cellular networks through the transmission protocols.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Identify the physical properties of wireless communication system and analyze the medium access control mechanisms for wireless communication.
2. Analyze the various standards of telecommunication networks and broadcast systems.
3. Analyze the performance of IEEE 802.11 and HIPERLAN for wireless local area networks.
4. Design a network for Mobile IP and apply the routing algorithms for the given network scenario.
5. Analyze the different mechanisms of the transmission control protocol that influence the efficiency of mobile environment.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3	2										3	
2	1	2			3								2	
3	1	2	3										2	
4	1	3	2										1	
5	1	2	3										3	

UNIT I **9 Hours**

WIRELESS COMMUNICATION FUNDAMENTALS

Need and Application of wireless communication - Wireless Data Technologies Market for mobile Wireless transmission - Frequencies for radio transmission- Signals - Antennas - Signal Propagation- Multiplexing - Modulations - Spread spectrum - MAC - SDMA - FDMA - TDMA - CDMA.

UNIT II **9 Hours**

TELECOMMUNICATION NETWORKS

Telecommunication systems - GSM - DECT systems - Architecture and protocols - Tetra frame structure - UMTS basic architecture and UTRA modes - Broadcast Systems - DAB - DVB.

UNIT III **9 Hours**

WIRLESS LAN

Introduction Infrared v/s Radio transmission - Infrastructure and ad-hoc network - IEEE 802.11 - Architecture - services - MAC - Physical layer - IEEE 802.11a - 802.11b standards HIPERLAN - Blue Tooth.

UNIT IV **9 Hours**

MOBILE NETWORK LAYER

Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations) - Dynamic Host Configuration Protocol - Routing - DSDV - DSR - Alternative Metrics.

UNIT V **9 Hours**

TRANSPORT AND APPLICATION LAYERS

Traditional TCP - Indirect TCP - Snooping TCP - Mobile TCP - Fast retransmit/fast Recovery - Transmission/time - out freezing - Selective retransmission - Transaction oriented-Classical TCP improvements.

FOR FURTHER READING

Mobile WiMax - Multihop relay networks - Femtocells and fixed-mobile convergence

Total: 45 Hours

Reference(s)

1. Jochen Schiller, Mobile Communications, PHI/Pearson Education, 2003.
2. William Stallings, Wireless Communications and Networks, PHI/Pearson Education, 2005.
3. Kaveh Pahlavan and Prasanth Krishnamoorthy, Principles of Wireless Networks- A Unified Approach, PHI/Pearson Education, 2002.
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, Principles of Mobile Computing, Springer, New York, 2003.
5. Hazysztof Wesolowshi, Mobile Communication Systems, John Wiley and Sons Ltd, 2002.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4					6	6			4															20
2		4					6				6			2										2	20
3	4						2			6				2											14
4	4						6			6				6				4							26
5	4					6	6											4							20
Total																									100

Assessment Questions

Remember

1. Enumerate the applications of wireless networks.
2. Define ASK and FSK with diagram.
3. Does GPRS need new information? Why?

4. Whether DVB can be used for High speed internet –justify?
5. What are the benefits of reservation schemes in TDMA?
6. What is the basic task of MAC layer in IEEE 802.11?
7. Write any two factors that affect the performance of Ad-hocÂ networking?
8. Enumerate the roles played by Foreign Agent (FA) in assistance to MobileÂ node (MN).
9. Discuss some of the routing metrics to be considered in a mobileÂ network layer.
10. Define the role of transaction layer in WAP?

Understand

1. Does GPRS need new information? Why?
2. Looking HLR/VLR database approach used in GSM –how does it limits the scalability inÂ terms of uses?
3. Compare and contrast IEEE 802.11 WLAN, HiperLAN and Bluetooth with a typicalÂ example.
4. How handover is carried out in WATM and list the requirements ofÂ location management in WATM.
5. Discuss some of the routing metrics to be considered in a mobileÂ network layer.
6. Why agent solicitation is necessary?
7. Enumerate the roles played by Foreign Agent (FA) in assistance to MobileÂ node (MN).
8. Identify the purpose of DHCP in achieving mobility in network layer?
9. Discuss some of the routing metrics to be considered in a mobileÂ network layer.
10. Draw the packet format of Registration request in Mobile IP

Apply

1. How polling scheme establish master slave relationship to allocate time slotsÂ in TDMA?
2. How does inhibit sense multiple access (ISMA) detects a shared medium isÂ busy or not?
3. Whether DVB can be used for High speed internet –justify?
4. How data burst format is defined in GSM system?
5. How does a Bluetooth device discover a Bluetooth network?
6. Give a neat sketch of Format of an IEEE 802.11 PHY frame usingÂ FHSS.
7. What could be the quick solutions to achieving mobility in network layerÂ and why they don’t work?
8. Why does I-TCP isolate problems on the wireless link?
9. Why has a scripting language been added to WML? How can thisÂ language help saving bandwidth and reducing delay?
10. Describe the several standard libraries for WMLScript specified by WAP.

Analyse

1. Looking HLR/VLR database approach used in GSM –how does it limits the scalability inÂ terms of uses?
2. How does inhibit sense multiple access (ISMA) detects a shared medium isÂ busy or not?
3. Why CSMA/CA fails in wireless networks?
4. Perform coding and spreading of the following data 101 with sender A andÂ data 100 with Sender B whose key values are Ak=010011 and Bk=110101Â respectively. Draw and explain the coding and spreading of both A and BÂ along with their reconstruction using CDMA.
5. Analyze the Â GSM,DECT, TETRA and UMTS systems with reference to the functions of OSI layers.
6. Is directional antenna useful for mobile phones? How can the gain of an antenna be improved?
7. What features of a GSM system is provided by the SIM card in a mobile station?
8. With a focus on security, what are the problems of WLANs? What level ofÂ security can WLANs provide, what is needed additionally and how far do theÂ standards go?
9. Explain how tunneling works in general and especially for mobile IP usingÂ IP-in-IP, minimal, and generic routing encapsulation, respectively. DiscussÂ the advantages and disadvantages of these three methods.

Evaluate

1. Evaluate the security features of WAP and find out the problems that will occur in WAP security layer.
2. Can the problems using TCP be solved by replacing TCP with UDP? Where could this be useful and why is it quite often dangerous for network stability?Â

Create

1. Develop a simple mobile content application for telecommunication systems.
2. Design an architecture for a mobile computing based business application.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT013 OPEN SOURCE SYSTEMS 3 0 0 3

Course Objectives

- Impart knowledge on Opensource system and its benefits in application development
- learn different open source system such as Language, Database and operation system
- Develop web based applications using open source systems

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Understand Open Source Software tools and techniques and apply tools to develop custom Linux environment
2. Apply MySQL to develop database for real-time application
3. Apply Open Source programming language to develop real-time application
4. Understand and apply python functions to create real-time application
5. Apply Open Source Softwares in developing web based Applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2				1		-							
2	1				2									
3	2				2									
4	2				2									
5	1		2										2	

UNIT I **11 Hours**

INTRODUCTION TO OPEN SOURCE OPERATING SYSTEMS

Introduction to Open Sources - Need of Open Sources -Advantages of Open Sources Application of Open Sources - Sources LINUX Introduction General Overview Kernel Mode and User Mode Process - Advanced Concepts -Scheduling - Personalities - Cloning - Signals -Development with Linux.

UNIT II **8 Hours**

OPEN SOURCES DATABASE

MySQL: Introduction - Setting up account - Starting, Terminating and Writing your Own SQL programs- Record Selection Technology - Working with Strings - Date and Time - sorting Query Results - Generating Summary - Working with metadata - Using Sequences - MySQL and Web.

UNIT III **10 Hours**

OPEN SOURCES PROGRAMMING LANGUAGES

PHP - Introduction - Programming in Web Environment - Variables - Constants - Data Types - Operators -Statements - Functions - Arrays - OOP - String Manipulation and Regular Expression - File Handling and Data Storage - PHP and SQL Database - PHP and LDAP - PHP connectivity - Sending and Receiving E-mails - Debugging and Error Handling - Security - Templates

UNIT IV **9 Hours**

PYTHON

Syntax and Style - Python Object - Numbers - Sequences - Strings - Lists and Tuples - Dictionaries - Conditional and Loops - Files - Input and Output - Errors and Exceptions - Functions - Modules - Classes and OPP - Execution Environment.

UNIT V **8 Hours**

SERVER TECHNOLOGIES

Web Server: Apache Server - Working with Web Server - Configuring and Using Apache Web Services - MDA - Introduction to MDA - Geneses of MDA - MDA Applications-Database servers and application servers

FOR FURTHER READING

MongoDB-Android-Ruby on rails - Webkit - openBSD - Unidata - Firebird - LAMP Stack

Total: 46 Hours

Reference(s)

1. M. N. RAO,Fundamentals of Open Source Software,PHI Learning Private Limited,2015
2. Rasmus Lerdorf and Levin Tatroe, Programming PHP, oreilly, USA, 2013.
3. Wesley J. Chun and Core Python Programming, Third edition Prentice Hall, New Delhi, 2012.
4. SAdam Gamble, Cloves Carneiro Jr, Rida Al Barazi, Beginning Rails 4, APRESS, 2014.
5. Peter Wainwright, Professional Apache. Wrox Press, New Delhi, 2010
6. H.S. Lahman Model-Based Development: Applications 1st edition Pearson Education Inc,2011

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	4			2	6								2											18
2		2	2			6				2					8										20
3	2	2					4			2				2	6			4							22
4		2	2				6								6								4		20
5		2				4				2				4	4							4			20
Total																									100

Assessment Questions

Remember

1. List some of the GNU tools
2. What are the various PHP's LDAP client functions?
3. What are the different error handling methods in PHP?
4. What is the system call available to change the personality?

5. Give the system call for cloning.
6. Explain the tools that are available for managing MySQL Server.
7. List the two types of methods for retrieving rows in Python.
8. Explain the features of linux with respect to different linux distributions.
9. What are the packages required to secure server with SSL
10. How do you keep track of different versions of code.

Understand

1. List the four important factors that led to the development of open source software.
2. What are the various types of errors in python?
3. Define restricted execution and terminating execution
4. What are the ways in which signal can be generated?
5. List five environmental variables. Describe their roles.
6. What is shell programming. Explain with examples how expressions are evaluated in the shell programming.
7. Write a note on Process management with linux along with relevant command used for the process management.
8. How can we obtain digital certificate from Certifying digital authority.
9. Explain various pipes and redirects
10. What is the role of init signal?

Apply

1. Write a simple Python program using MYSQL database
2. Write GUI programs using FOSS tools in Linux
3. How can you connect to the MySQL Server
4. How can you access elements using slice operator?
5. How to Access Values(Characters and Substrings) in Strings.
6. Explain the role of Linux in Android Architecture.
7. Python is multi threading. Is it a good idea? List some of the ways to get some python code to run in a parellel way.
8. Write a note on "Working with a web using shell script".
9. Explain the role of /etc/shadow and /etc/group files with respect to user administration.
10. How is Logical Volume Manager is used in Linux kernel.

Analyse

1. Distinguish Kernel mode and user mode.
2. List out the difference between mysql_connect and mysql_pconnect?
3. Analyze the differences between MySQL_fetch_array(), MySQL_fetch_object(), MySQL_fetch_row()?
4. Define flat files and mention its advantages over databases
5. Differentiate function and procedure
6. How function Declaration and Definition are different from other programming languages
7. Compare Open source software with other software

Evaluate

1. Why do so many organizations use MySQL?
2. What are the capabilities provided by MySQL client APIs?
3. List out the characteristics of LDAP

Create

1. Describe the steps for configuring linux machine as the DNS Server.
2. Explain partition of hard disk with respect to dual boot environment. Also explain the purpose of boot loader.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT014 BIOINFORMATICS 3 0 0 3

Course Objectives

- Understand the purpose and categories of Bio informatics technologies.
- Understand the neural network concepts in Bioinformatics.
- Study about the Micro array Analysis.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Understand the concepts of genomics, proteomics and Data mining in Bioinformatics
2. Evaluate bioinformatics algorithms such as dynamic programming, hidden markov models and monte carlo
3. Design various bioinformatics tools for pattern matching and visualization
4. Apply Microarray Analysis for Gene classification and genome expression
5. Apply bioinformatics and biological information system to computer application. Also understand the concept of DNA and amino acid sequences.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3		2				2			2		3	2
2	3			3			1		3	1	3	2	3	2
3	1		3		2			1	1		3		2	
4	3		2			3		3		3		2	3	3
5	3		3		2		2	3		1		2	1	3

UNIT I **9 Hours**

INTRODUCTION

Need for Bioinformatics technologies -Overview of Bioinformatics technologies -Structural bioinformatics- Data format and processing -secondary resources and applications - Role of Structural bioinformatics.

UNIT II **9 Hours**

DATA WAREHOUSING AND DATA MINING IN BIOINFORMATICS

Bioinformatics data - Data warehousing architecture - data quality - Biomedical data analysis - DNA data analysis - Protein data analysis - Neural Network Architecture -Neural Network Applications in Bioinformatics.

UNIT III **9 Hours**

MODELING FOR BIOINFORMATICS

Hidden markov modeling for biological data analysis -Sequence identification - Sequence classification - multiple alignment generation - Comparative modeling - Protein modeling - genomic modeling - Probabilistic modeling - Bayesian networks - Boolean networks - Molecular modeling.

UNIT IV **9 Hours**

PATTERN MATCHING AND VISUALIZATION

Gene regulation - motif recognition - motif detection - strategies for motif detection - Visualization - Fractal analysis - DNA walk models - one dimension - two dimension - higher dimension - Game representation of Biological sequences .

UNIT V **9 Hours**

MICROARRAY ANALYSIS

Microarray technology for genome expression study - image analysis for data extraction - preprocessing - segmentation - gridding - spot extraction - normalization, filtering - cluster analysis - gene network analysis - Compared Evaluation of Scientific Data Management Systems - Cost Matrix - Evaluation model - Benchmark.

FOR FURTHER READING

Biological Data Integration System - Applications in bioinformatics- Computer programs for molecular modeling- DNA, Protein, Amino acid sequences- Tradeoffs -Drug Discovery Process.

Total: 45 Hours

Reference(s)

1. Arthur M.Lesk, Introduction to Bioinformatics,4th edition Oxford University Press, 2014.
2. Gautam B. Singh, Fundamentals of Bioinformatics and Computational Biology: methods and exercises in Matlab, Springer, 2014
3. Yi-Ping Phoebe Chen, BioInformatics Technologies, Springer Verlag, 2010

4. M. Abhilash, Introduction to Bioinformatics and Microarray Technology, CBS Publishers & Distributors, 2010

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1		8					5		3				3					3					3		25
2			7			5				3			3						3						21
3	5						6				4														15
4		5			4			5	5						4										23
5		5					5										3							3	16
Total																									100

Assessment Questions

Remember

1. What are the three primary roles of Hidden Markov Modelling ?
2. What is called Dirichlet density?
3. What are the key steps in the PHMM for multiple sequence?
4. State Comparative modeling.
5. State some of the Comparative Modeling Servers.
6. What is meant by Probabilistic Boolean Networks?
7. State twenty different kinds of amino acids.
8. What are the important problems in DNA and protein sequence analyses?
9. Give formula for one-dimensional case in multifractal analysis.
10. State the characterization of polypeptide structure for Protein structure.
11. What are the data formats used in Bio informatics?

Understand

1. Define one dimensional DNA walk model .
2. Define HP model.
3. Define generalized fractal dimensions.
4. Define scaling exponent for multifractal analysis.
5. Define Single Gene, Multi-species Approach.
6. Define Multifractal Analysis.
7. Why microarray technology is important?
8. List out the Preprocessing step Image analysis.
9. How filtering is done Image analysis in microarray?
10. Mention the characteristics of Biological data in Bioinformatics.

Apply

1. Apply the Object-oriented method to design data in Biological Database to provide powerful search based on relation.
2. SRS is information retrieval system using specified keywords. By using SRS functionality, how to extract biological data sequences.
3. Identify ethical situations that healthcare workers may face and how to apply the principles of moral problem solving to ethical decision making. Describe the roles of the risk management department of the healthcare facility.
4. Enumerate various machine learning approaches used in computational biology.
5. Apply the Hidden Markov Modeling for Multiple Alignment Generation.
6. Using PHMM how to find the most probable path for Multiple Alignment.
7. Identify the general characteristics of Bayesian Networks works and how its helpful for Modeling in protein analysis.
8. Using Chaos Game Representation explain the Protein Structures formation.
9. Implement multifractal spectra for classification Genes in biological process.
10. Apply Hybrid Petri Net for for biological processes

Analyse

1. Compare Bayesian Networks and Probabilistic Boolean Networks
2. Compare Protein and Genomic modeling.
3. How Protein conformations are done in Game representation?
4. How Modern Computer Programs are helpful for Molecular Modeling?
5. Differentiate PCA and ICA.

Evaluate

1. Explain the Needs of Bioinformatics Technologies.
2. Describe the process of Functional Assignments in Structural Genomics
3. Describe in detail about structural classifications with example.
4. Discuss in detail about Hierarchical Framework for Identification.
5. Explain the steps that followed for Genomic modeling.

Create

1. Sketch out Boolean cell regulation representation and explain the Basic unit of Probabilistic Boolean Network.
2. Derive generalized fractal dimensions for sequence derivation.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT015 JAVA FRAMEWORKS 3 0 0 3

Course Objectives

- Understand the fundamental components of struts 2 framework to design web applications using struts 2 framework
- Understand design and architecture of Spring MVC and to develop web applications using spring MVC .
- map java classes to database tables using hibernate and develop web applications using Struts, Spring and Hibernate
- Develop persistent classes for the applications using Hibernate.
- Create web applications using Association, HQL and Java collections framework.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Design and deploy web applications using struts 2 framework.
2. Apply struts MVC architecture to develop web applications using interceptors and results.
3. Create enterprise applications using spring Aspect Oriented Programming and Transactions.
4. Develop persistent classes for the applications using Hibernate.
5. Create web applications by using association, HQL and Java collections framework.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	3		2									
2	2	1	3		2									
3	2	2	3		2									
4	2	2	3		2									
5	2	-	3		2									

UNIT I **9 Hours**

STRUTS 2

Strut 2 frameworks and its architecture- Web applications-Frameworks for web applications-Introduction to strut2 frameworks-Architecture of struts application- annotations-struts2 actions-Packaging actions-Implementing actions-Transferring data into objects.

UNIT II **9 Hours**

INTERCEPTORS AND VALIDATION

MVC-Interceptors-Built in interceptors-Declaring interceptors-creating interceptors-Introduction to OGNL-Struts tags-data tags-control tags-using JSTL-Result types- Result Global results-Introduction to validation framework- Introduction to i18n.

UNIT III **8 Hours**

SPRING

Spring modules-Inversion of control(IOC)-Injecting dependencies-IOC in enterprise applications-Introduction to Aspect oriented programming-Bean factory-Application context-Life cycle of beans-Wiring with XML-Injecting dependencies via setters, constructors-Introduction to Auto wiring-AOP-Creating advice-Defining point cuts-Managing Transactions-Understanding transactions-Programming transactions-Declaring transactions-Securing spring applications-Acegi security-Managing authentication-controlling access-securing web applications - Spring Webflow

UNIT IV **9 Hours**

HIBERNATE

Object Persistence-using direct jdbc-Persistence with hibernate-configuring hibernate- creating mapping definitions-building session factory-Persisting- retrieving objects-session cache-connection pools-Transactions.

UNIT V **9 Hours**

HIBERNATE QUERY LANGUAGE

Association-Types-components-Persisting collections and array-HQL-Querying objects with HQL-Criteria queries-stored Procedures- Integrating struts, spring and hibernate.

UNIT VI **6 Hours**

FOR FURTHER READING

Play : layout customization , validation ? Spark : using WebSockets and Spark to create a real-time chat app

Total: 50 Hours

Reference(s)

1. Donald Brown, Chad Michael Davis and Scott Stanlick, Struts 2 in action, second edition, Manning Publications 2008
2. Craig Walls, spring in action, Manning Publications, Third Edition, 2011
3. Patrick Peak and Nick Heudicker, Hibernate Quickly, Manning Series, 2005
4. Nicolas Leroux and Sietse de Kaper, Play for Java, Manning, 2014

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1			2								12											6			20
2		6					2				12														20
3			2			2									6				6			4			20
4			2			2									6				6			4			20
5						2									12								6		20
6																									0
Total																									100

Assessment Questions

Remember

1. Define Model-View- Controll Architecture.
2. List the supports provided by Struts2.
3. State the purpose of dispatcher Resultype.
4. List the four types of Struts Tags.
5. List the modules in core containers.
6. Define Spring Framework.
7. State the advantages of ORM over JDBC.
8. **Define the detached objects in hibernate.**
9. Define criteria in hibernate.
10. List the methods used to create HQL and SQL Queries.

Understand

1. Identify the requirement for actions in Struts2.
2. Summarize the difference between Struts 1 and Struts 2.
3. Identfiy the suitable interceptor for file upload support.
4. Explain the need for Validation mechanisms to validate the user input.
5. Compare Bean Factory and ApplicationContext
6. Illustrate with an example how dependency injection minimizes the amount of code in the application.
7. Infer that the hibernate needs a public mutators (setters/getters).
8. Illustarte the concept of Hibernate to take the values from Java class attributes and persist them to a database table.
9. Differentiate between HQL and SQL.
10. Explain the deployment structure of hibernate with a web application.
11. Classify the built in types defined for mapping java and sql types.

Apply

1. Implement the simple login page using Struts 2 Architecture and deploy the application in Apache server to test it.
2. Design a welcome page using Struts 2 MVC architecture.
3. Implement the validate method to check the wheteher username field is blank or not.
4. Use the timer interceptor to measure how long it took to execute an action method defined is login Action class.
5. Create a simple application that takes the name of the person and his age from the user form usingÂ spring.
6. Use JdbcTemplae class to connect a student database with your application to search for a particular student.
7. Implement an application class to store the details of the paricipants regitered for event using hibernate.
8. Design a POJO class " Employee" with setters and getters for the following information.
   a) Emp_name b) Emp_Id c) Emp_Age d) Emp_Salary
9. Demonstrate how you would use the Order class to sort the result set obtained from a table.
10. Design criterias for the following scenarios.
    To get records having salary more than 2000.
    To get records having salary less than 2000.
    To get records having fistName starting with "Di"

Analyse

1. is it necessary to design a web page using framework like struts ? Justify the answer.
2. In Struts1, the front-controller was a Servlet but in Struts2, it is a filter. Resolve the possible reason to change it to a filter .
3. Does the order in which interceptors execute matters ?Â If yes then why ?
4. Differentiate between EL and OGNL.
5. A bean can be marked abstract by abstract=true, does not that mean we have to make the corresponding java class abstract ?

6. What would happen if we have a prototype bean injected into a singleton bean ? How many objects of prototype bean object will be created ?
7. Is it mandatory to have the hibernate objects implement Serializable ? Justify your answers.
8. if you use more than one database in your application,How many SessionFactory objects are needed ? Conclude the answer.
9. Why it is considered a best practice to have the setter of the id to be private ?Justify the answer.

Evaluate

1. if you have a column of fixed character length , Determine the mapping type to be used in hibernate.

Create

1. Create a web application for a student portal by integrating struts and hibernate.
2. Design a web application for an online Quiz.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT016 ARTIFICIAL INTELLIGENCE 3 0 0 3

Course Objectives

- Recognise the characteristics of AI that make it useful to real-world problems
- Understand the strengths and limitations of various state-space search algorithms, and choose the appropriate algorithm for a problem

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Understand in which agents and environments vary, along with key functions that must be implemented in a general agent
2. Apply agents using search algorithms such as uninformed search, informed search or local search
3. Apply the Knowledge representation techniques in applications which involve perception, reasoning and learning.
4. Apply the basic principles, models, and algorithms of AI to recognize, model, and solve problems in the analysis and design of information systems
5. Analyze and design a real world problem for implementation and understand the dynamic behavior of a system

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3		2										1
2	3	2		2									2	1
3	3		3	2								-	2	1
4	3		2	2									1	1
5	3			1		-							1	1

UNIT I **7 Hours**

INTRODUCTION

Basic definitions, History, Intelligent agents, Agents and environments, Structure of agents - Problem Solving - Problem solving agent

UNIT II **10 Hours**

SEARCHING TECHNIQUES

Informed search and exploration - Informed search strategies - heuristic function - Local search algorithms and optimization problems - Local search in continuous spaces - Online search agents and unknown environments - Constraint satisfaction problems (CSP).

UNIT III **10 Hours**

KNOWLEDGE BASED AGENTS

Knowledge representation, Logic, Proposition, Inference, First order logic, Inference in FOL, Algorithms, Knowledge representation issues, Semantic Net, Frames

UNIT IV **9 Hours**

LEARNING AGENTS

Learning from observations - forms of learning - Inductive learning - Learning decision trees - Ensemble learning - Knowledge in learning - Logical formulation of learning - Explanation based learning - Learning using relevant information.

UNIT V **9 Hours**

PLANNING AND PROBABILISTIC AGENTS

Planning problem, Partial order planning, Conditional planning, Multi agent planning, Uncertainty and probabilistic reasoning

FOR FURTHER READING

Medicine, Industrial automation, FMS and Robotics, Management and Business Intelligence

Total: 45 Hours

Reference(s)

1. Russell, Peter Norvig, Artificial Intelligence - A Modern Approach, 3rd Edition, Prentice Hall of India, 2009
2. Kevin Knight, Elaine Rich and Nair, Artificial Intelligence, Tata McGraw Hill, New Delhi, 2008
3. Mishra R B, Artificial Intelligence, PHI Learning Pvt. Ltd., New Delhi, 2011
4. Padhy N P, Artificial Intelligence and Intelligent Systems, Oxford University Press, New Delhi, 2005
5. Nils J Nilsson, Artificial Intelligence Ã¢?? A New Synthesis, Morgan Kaufmann, New Delhi, 2007
6. Dan W Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Learning Pvt. Ltd., New Delhi, 2010

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	6			4	4								2											18
2		2	2		2	4				2					8										20
3	2	2					4			2				2	6			4							22
4		2					6								6								4		18
5		4			4					2				4	4							4			22
Total																									100

Assessment Questions

Remember

1. What are the approaches followed to have AI?
2. Define AI
3. What is a rational agent?
4. What are the elements of an agent?
5. What are the various local search algorithm?
6. What are the various local search algorithm?
7. Explain the various forms of learning
8. What are the two choices for activation function?
9. What are the categories of neural network structures?
10. What is an ensemble learning?
11. What are the components of a genetic algorithm?
12. Explain any two heuristic searches in detail

Understand

1. Define Agent with a diagram
2. Explain the various methods of logical formulation in logical learning?
3. Write in detail the EM algorithm.
4. What are the various steps in knowledge engineering process of a first order logic?
5. Give the Syntax and Semantics of a first order logic in detail with an eg
6. Explain in detail the concept of theorem provers
7. Explain forward chaining and backward chaining in detail for a first order definite clauses
8. Explain constraint satisfaction problem with an example
9. What is greedy best first search?
10. What is admissible heuristic?
11. What are the various steps in knowledge engineering process of a first order logic?

Apply

1. State the design issues that affect the learning element.
2. State the factors that play a role in the design of a learning systems.
3. How learning is done on a complete data using statistical methods?
4. What is a model based reasoning systems?
5. What are the problems faced by a local search algorithm?
6. Explain online search agent working using depth first exploration
7. Explain genetic algorithm as a local search
8. Write in detail the learning of an agent in online search method
9. Explain how solutions are searched by a problem solving agent
10. Elaborate upon the process of knowledge engineering with electronic circuits domain.

Analyse

1. Distinguish omniscience and rationality

2. State the difference between utility function and performance measure
3. State the difference between agent function and agent program?
4. What is the difference between the two quantifiers in the logics
5. What distinguish general purpose ontology and special purpose ontology?
6. What are the reasons for the introducing of quasi-logical form?
7. Differenctiate Online search and offline search.
8. Analyze the factors that affect the Quality of heuristic.

Evaluate

1. Write a PEAS description for an automated taxi?
2. State the decision tree as a performance element.
3. How are explanation based learning done?

Create

1. Write a PEAS description for an automated taxi?
2. Write a PEAS description for an automated taxi?
3. Explain parsing for a search problem with chart-parsing algorithm
4. Elaborate on the semantic augmentations for an English fragment including tense, quantification and pragmatic interpretation.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT017 USER INTERFACE DESIGN 3 0 0 3

Course Objectives

- Learn the theories and principles underlying web site design.
- Understand how to develop web sites through an iterative process.
- Provide necessary skills in using the various technologies and tools for developing web sites.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Apply suitable Principles for User Interface Design to enhance Graphical User Interface and Web User Interface
2. Apply the concept of Basic Business Functions, Business Definition and Requirement Analysis for Interface Design
3. Design the Structure for Menus and integrate proper controls for efficient Windows Framework
4. Design an efficient User Interface based on International Considerations and incorporate with Multimedia
5. Analyze the performances of Layout using Prototypes and test the layout for usability in Windows

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3									-	-	
2	1	2	3									-	-	
3		3	1		2							-	-	
4			3	2	1							-	-	
5		2		1	3							-		

UNIT I **8 Hours**

THE USER INTERFACE-AN INTRODUCTION

Defining the User Interface- The Importance of Good Design- The Graphical User Interface- The Web User Interface- The Merging of Graphical Business Systems and the Web- Principles of User Interface Design.

UNIT II **10 Hours**

HUMAN COMPUTER INTERACTION

Obstacles and Pitfalls in the Development Path- Usability- Understand how people Interact with Computers- Important Human Characteristics in Design- Human Considerations in Design- Human Interaction Speeds- Business Definition and Requirement Analysis- Determining Basic Business Functions- System training and Documentation Needs-Human Consideration in Screen Design- Technological Considerations in Interface Design.

UNIT III **9 Hours**

WINDOWS

Structure of Menus-Functions of Menus- Content- Formatting- Phrasing- Selecting Menu Choices- Navigation Menus- Kinds of Graphical Menus- Window Characteristics- Components of Window- Selecting The proper controls- Words, Sentences, Messages and Text- text for Web Pages.

UNIT IV **8 Hours**

MULTIMEDIA

Providing the Proper Feedback- Guidance and Assistance- International Considerations- Accessibility- Icons- Multimedia.

UNIT V **10 Hours**

WINDOWS LAYOUT TEST

Possible Problems with Color-Choosing Colors for Textual Graphic Screens- Organizing and Laying out Screens- The purpose of Usability Testing- Scope- Importance- Prototypes- Developing and Conducting Test- Analyze, Modify and Retest.

FOR FURTHER READING

UI MOCKUP Design- UX designer Networking

Total: 45 Hours

Reference(s)

1. Wilbert O. Galitz ,The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, 3rd Edition,, March 2007, reprint 2015.
2. Alan Cooper, The Essential Of User Interface Design, WileyDream Tech Ltd.,2002.
3. http://www.uxnet.org/
4. http://www.adobe.com/products/fireworks.html

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	1				2		1			1				1	12			4							22
2		3				1				6				2			1	2			1	1	2		19
3		2			2	2					12														18
4	1	1	2		2	2			1									12							21
5		1			1				2					2						2			12		20
Total																									100

Assessment Questions

Remember

1. State the Characteristics of Direct Manipulation
   .
2. List any four Graphical system disadvantages.
3. Define Visualization.
4. Compare the Characteristics of graphical and web user interface.
5. Discuss the advantages and drawbacks of graphical systems in detail.
6. With a neat sketch discuss the structure and content of menus.
7. Explain in detail about the characteristics and types of Icons.
8. What are the different kinds of usability testing?Explain four in detail.
9. **List some software tools used for user interface design.**
10. How to eliminate blue border arround the linked image on web page?

Understand

1. With an example elaborate the techniques used for requirements analysis.
2. Discuss in detail about any four presentation controls.
3. **Differentiate between cascading and unfolding**
4. Give any 2 applications which utilize the human interaction speed.
5. Justify why direct manipulation is not feasible for all screen objects and actions.
6. Differentiate GUI and Web Page Design
7. Explain the importance of human consideration in UI design with suitable example?
8. What are the different ways to integrate a CSS in to webpage?
9. How will non supporting browsers support DHTML?
10. List different types of style sheets and how to link them?

Apply

1. With an example explain how to separate content and design in CSS?
2. With suitable illustration explain the importance of human consideration in user interface design.
3. With suitable examples explain how accessibility in web pages is improved with the help of images and icons.
4. Discuss in detail about the three dominant paradims in the development of user interface with an example.
5. Consider online railway booking system as an example and explain in detail about gizmos and its types.
6. With a neat sketch explain briefly about the Structure of Menus and how they can be phrased.Â
7. Explain the types of Device Based Controls and also mention the guidelines for selecting the proper device-based controls.
8. Assume that a text has to be fixed over an image. Specify the steps to perform this operation.
9. Develop a conceptual model of the system based upon the libary book management model.
10. What are the obstacles encountered in user interface design process? Discuss the impact of human characteristics in design with suitable example.

Analyse

1. If background and colour should always be set together, then why do they exist as separate properties?
2. Compare and contrast device based controls and screen based controls.
3. Is UID Important? Why?
4. Difference between direct and indirect Manipulation.
5. Distinguish between undo and redo operations.
6. Identify the factors involved in choosing platforms for design and development of system.
7. Justify why direct manipulation is not feasible for all screen objects and actions.

Evaluate

1. Is human considerations in design is important. Justify.
2. When do you have to do localization?

3. With suitable examples explain how the human characteristics improve the web user interface design.

Create

1. Develope a proper design for given Requirement "Raghu wants to develop a portal for his shop to encourage their customers for online shopping. His customer can vary from young age to old age. Â He does not want to unsatisfy his customer to move between many pages and to type more. He needs a portal in such a way that it can also be accessed through keyboard also. Design a screen prototype to satisfy Raghu to give you the order"
2. Design a website for following Requirement "Sharanya wants to develop an education portal as virtual class room for her subject. She wants only her students to access the portal to submit assignment, online test. She will make corrections and post again. Students can access notes and her lecture from the portal. Develop a prototype to implement all the functionalities"

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT018 3D GAME PROGRAMMING 3 0 0 3

Course Objectives

- Learn the Graphical user Interfaces for 3D games with modern technologies.
- Understand the multi-file 3D games with collision detection and scoring.
- Discover the appropriate methods for handling 3D Game effects with Visibility.

Programme Outcomes (POs)

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Outcomes (COs)

1. Use the principles and techniques with real-time rendering for 3D game programming.
2. implement the multi-file 3D games with collision detection and scoring.
3. Analyze the techniques used to measure the factors affecting 3D graphics performance

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3											
2		2	3		1									
3		1	2								1			

UNIT I **9 Hours**

MATHEMATICAL PREREQUISITES

Vector Algebra- Vectors and Coordinate Systems-Coordinate Systems- Basic Vector Operations- Length and Unit Vectors- The Dot Product- Orthogonalization - Matrix Algebra - Matrix Multiplication - The Transpose - Identity Matrix -Adjoint-Inverse matrix

UNIT II **9 Hours**

TRANSFORMATIONS

Linear Transformations - Matrix Representation - Scaling - Rotation - Affine Transformations - Translation- composition - Geometric Interpretation - Affine Transformation Matrix- change of coordinates - Associativity

UNIT III **9 Hours**

3D INITIALIZATION

Direct3D Overview - COM - Textures and Data Resource Formats - Multisampling - Feature Levels - Initializing Direct3D - Creation - Quality support - swap chain - target view - viewreport - Timing & Animation- Application framework - Debugging

UNIT IV **9 Hours**

3D FOUNDATIONS

Rendering Pipeline - computer color - topology - Vertex Shader Stage - The Geometry Shader Stage - Clipping -The Rasterization Stage -Vertices and Input Layouts - Buffers - Effects - Light and Material Interaction - Spotlights - implementation.

UNIT V **9 Hours**

3D VISIBILITY DETERMINATION

Bounding Volume Tests -Testing Against the View Frustum -Testing for Occlusion Partitioning Techniques - Grid Systems - Quadtrees and Octrees - BSP Trees -The Geometry Shader - The Compute Shader - The Tessellation Stages

FOR FURTHER READING

View Transform Review - The Camera Class - Method Implementations - Hardware Instancing - Bounding Volumes and Frustums - 3D picking - Cube Mapping - Terrain Rendering - Particle Systems and Stream-Out- Character Animation - Loading 3D Animation Data.

Total: 45 Hours

Reference(s)

1. Frank D. Luna, Introduction to 3D Game Programming, Mercury Learning and Information, 2012.
2. Jacob Seidelin, HTML 5 Games, Wiley Publications, 2014.
3. Tom Miller, Beginning 3D Game Programming, Sams Publications, 2005.
4. Jonathan S. Harbour, Game Programming All in One, Third Edition ,Thomson Course Technology, 2006.
5. Fletcher Dunn and Ian Parberry, 3D Math Primer for Graphics and Game Development, Wordware Publishing Inc, 2002.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1		2				2				2				2											8
2			4				2		4				4												14
3					4					8				8			8								28
4						4			6				6					4			4				24
5				4			2				12								8						26
Total																									100

Assessment Questions

Remember

1. What is the basic structure for developing a game?
2. Define“Pixel Art”.
3. How can you reduce game lag?
4. List the free multi-platform game library used for development.
5. Identify the important factor to considerd when working on a game.
6. How many polygons does the typical 3D accelerator chip process at a time?
7. name the function is used to create a custom 24- or 32-bit color.
8. What function is used to draw filled rectangles?
9. What is the name of the object used to hold a bitmap in memory?
10. Describes a function that draws a simple geometric shape, such as a point, line, rectangle, or circle.

Understand

1. Mention the term given to a small image that is moved around on the screen?
2. Identify the function that is used to initialize the keyboard handler
3. Infer the name of the array containing keyboard scan codes?
4. Discuss about the functions used to drawssprite with both rotation and scaling.
5. Give the Functions used to initialize the keyboard handler?
6. How to handle joystickbutton data using struct?
7. How to playa sampleaudio through the soundmixer?
8. Which function is used to draws a sprite with translucency?
9. Explain the functions used to converts a normal sprite into a run-length encoded sprite.
10. Discuss about the parameter used toÂ pass for theÂ installation of sound to initialize the standard digital sound driver.

Apply

1. Suppose that the view window has height 4. Find the distance d from the origin the view window must be to create a vertical fieldof view angle $\theta = 60°$.
2. Given a geometric description of a 3D scene and a positioned and aimed virtual camera in that scene, findÂ the rendering pipelineÂ refers to the entire sequence of steps necessary to generate a 2D image that can be displayed on a monitor screen based on whatthe virtual camera.
3. Use the “Shape” demo to use GeometryGenerator::CreateGeosphere instead of GeometryGenerator::CreateSphere. Try with 0, 1, 2, and 3 subdivision levels.
4. Construct the vertex and index list of a pyramidand draw it. Color the base vertices green and the tipvertex red.
5. Apply cinematic animation and Analyze about theÂ two 3D animation fields within the video game industry.
6. Why are asset-tracking sheets so important?
7. The resolution of a monitor has a direct effect on the deviceaspect ratio.What are vector graphics typically used for?
8. What is the name of the standard basic light setup used in capturing images, whether in photography or 3D animation?
9. A 3D VFX artist will break a simulation down into smaller piecesÂ to build up the final effect.Apply the rendering and justify
10. Why Laser scanning is used as a fast and efficient way to create usableÂ 3D geometry.

Analyse

1. Write a program that simulates a slide projector by projecting a texture onto the scene. Experiment with both perspective andorthographic projections.
2. Analyze and Modify the “Instancing and Culling” to use bounding spheres instead of bounding boxes.
3. Distinguish with the “Bézier Patch” by changing the control points to change the Bézier surface.
4. Difference betwwen Multisurface capture and Accurate Capture.
5. Why markerless motion capture is failed in Large Capture space?

Evaluate

1. How to organize mesh data and find thelow-level class called MeshGeometry toencapsulates the vertex and index buffers, as well todefinethe subsets of the mesh.
2. Identify thefunction that is usedÂ to prepare a variable for use within an interruptÂ callback routine?
3. Create Rigid bodies withtype of effectA. Soft and flimsy, like collisions anddeformations B.Hard collisions with deformations
4. Evaluate the performance of a parent-child relationship in 3D animation with ahierarchy setup enabling oneobject to control another objectunder it in the hierarchy.
5. Can SSAO be implemented on the compute shader? If yes, sketch out an implementation.

Create

1. Create a scenario withÂ Direct3D about how to usea Windows application that has a main window onto which we can render our 3D scenes.andÂ for theÂ games create a special message loop that checks for messages.
2. Manually create a .m3d file and fill it with cube data. Put the geometry of each face in its own subset so that there are six subsets. Texture each cube face with a different texture.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT019 ANIMATION FOR COMPUTER GRAPHICS 3 0 0 3

Course Objectives

- learn the overall structure of an interactive graphics program
- Master the use of geometric primitives for representing graphic objects
- Provide the basics of application programming interface (API) implementation on graphics hardware tools

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Understand the animation modelling and Graphics Techniques for creating interactive elements.
2. Use the graphical models to make animation with render, Illumination and Realism.
3. Implement the basic hardware tools used to receive incidents, Behavioural and Time movements.
4. To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles, and applications

5. Understanding the timed movements related to graphical models.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1											1
2	2	1	1											1
3	2	2	1		1	1							1	
4	2	1	1		1	1							1	
5	2	1	1		1	1							1	

UNIT I **9 Hours**

ANIMATION MODELLLING AND GRAPHICS

Principles of Computer Graphics - Coordinate systems - Clipping - Color theory - Modelling schemes - introduction - wire frame - boundry Representation - Volumetric Reperesentation - Procedural modelling Data structures - Graphics hardware

UNIT II **9 Hours**

RENDERING

Illumination Models - Reflection Models - Shading Techniques - Hidden Surface Techniques - ray tracing Radiosity - Realism - Introduction - Anti-aliasing - texture mapping - Bump mapping - shadows - Motion blur - Depth of Field - Opacity mapping

UNIT III **9 Hours**

ANIMATING

Representing attributes numerically - Animating numbers - parametric blending techniques - space curves - world coordination system - camera coordination system - Animating an objects attributes - illumination environment

UNIT IV **9 Hours**

ANIMATION TECHNIQUES

Phycial models -Manual Digitizing - Orthogonal Photographs - Laser Scanning - Flying Logos - Linked structures- Fabrics - human form - Special Techniques - Keyframe animation - Procedural Animation- Free-form Animation - Displacement Animation - Behavioural Animation - Dynamic Simulation

UNIT V **9 Hours**

TIMED MOVEMENTS

Basic attributes - Timing Machines - Screen Updates - Interrupt Service Routine - Display management- Input - Movement-Changing the Time base - Exit Handler - Timer ISR - Creating Depth and Motion-Remaping

FOR FURTHER READING

Introduction - Computers - Disk storage Image Capture - post production - Television Industry - Flight siulation Architecture- Advertising - Film Special efffects - 3D cartoons - scientific visualization - commericial animation systems

Total: 45 Hours

Reference(s)

1. Andy Beane, 3D Animation Essentials,Second Edition, John Wiley & Sons, 2012.
2. Rick Parent, Computer Animation:Algorithms & Techniques, Third Edition,Elsevier, 2012.

3. Peder Jungck, Graphics programming and animation, Prentice Hall, 2003.
4. John Vince , 3D computer animation , Addison Wesley 2002.
5. Mark Giambruno, Graphics and Animation : from starting up, Newriders Publishing, 2007.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1		2			2					2															6
2			2				4				6		2												14
3				2				2		12											6				22
4		2				8			2					12											24
5			6		6					8					8							6			34
Total																									100

Assessment Questions

Remember

1. Define quadric surfaces
2. What do you mean by shading of objects?
3. List the methods available in temporal aliasing.
4. Explain the terms: Multimedia, Hypermedia, MIDI, MPEG
5. What are the essentials and qualities for a good animated character?
6. Name the properties of piano curves.
7. Define ‘window’ and view port.
8. List out the methods used for smoothly joining two line segments.
9. Name the steps involved in 3D transformation?
10. Describe about various three dimensional display methods.

Understand

1. Why is it important to draw in perspective?
2. Distinguish between uniform scaling and differential scaling.
3. Identify the difference between Random scan/Raster scan displays.
4. Discuss the properties of Holographic images?
5. Differentiate between bitmap and pixmap
6. Differentiate perspective and parallel projection.
7. Explain the concept ofÂ Fractal Compression.
8. How Image Annotation is done?Â
9. How Image Annotation is done?Â
10. List out the drawbacks of shadow mapping.
11. Classify the advantages of flat shading with phone shading.

Apply

1. Write the syntax of smooth shading for 2/3 image.
2. Write the function of bitmap textures.
3. Show the difference Â between uniform scaling and differential scaling.
4. Illustrate about the projection types in three dimensional graphics.
5. State the resolution of Facsimile, Document Images and Photographic Images?
6. Name any two three dimensional graphics package procedures related with suitable visible surface.
7. Find the reflection of a triangle defined by the vertices A(1,1), B(5,1) and C(1,5) about a line y=2x+10.
8. Show the purpose of stencil buffer in shadowing?
9. Rotate a triangle ABC with vertices A(2, 3, 1), B(3, 4, 5) and C(5, 6, 7) about a line Y = 2
10. Prove that rotation followed by translation is not same as translation followed by rotation in three dimension

Analyse

1. Examine the following transformation with the matrix representations. Give suitable diagram for illustration.
   Translation.
   Scaling.
   Rotation
2. Prove that2D Translations are additive,2D Rotations are additive,2D Scalings are multiplication with respect to illumination.
3. Derive transformation matrix for rotation about a line parallel to one of the principle axis in space.
4. Derive transformation matrix for 3D scaling followed by rotation about fixed point
5. Prove that rotation followed by translation is not same as translation followed by rotation in three dimension

Evaluate

1. Rotate a triangle ABC with vertices A(2, 3, 1), B(3, 4, 5) and C(5, 6, 7) about a line Y = 2
2. Scale the surface A(2, 2, 2), B(4, 4, 4), C(5, 5, 5), D(6, 6, 6) with respect to point (7, 7)
3. Find the transformation matrix for 2D scaling followed by rotation about fixedÂ point
4. Construct an appealing character using the following shapes. Each shapeÂ must be used at least once.
   a) circle
   b) Triangle
   Â
5. Summarizethe general procedures for applying two dimensional basic transformations.

Create

1. Consider a Non-Interlaced raster system with resolution of 1280 By 1024, a refresh rate of 60 Hz, a horizontal retrace time of 5 Microseconds and a vertical retrace time of 500 μs. What is the fraction of the total refresh time per frame spent in horizontal retrace of the electron beam?
2. Derive transformation matrix for 3D scaling followed by rotation about fixed point

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT020 USABILITY ENGINEERING 3 0 0 3

Course Objectives

- Learn the basic concepts of Usability Engineering
- Emphasizes cost-effective methods to develop software projects
- Devising test plans for software applications

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Analyze the website usability based on human factor psychology and identify the goal of usability.
2. Design and analyze a website with UCD standards and usability guidelines
3. Differentiate traditional website with the website using CSS and design a usable website with higher user satisfaction.
4. Investigate on key design errors in simple interfaces and suggest alternative designs using usability metrics and heuristics.
5. Identify the design errors in using appropriate testing tools and techniques, and analyze the effectiveness of a website.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3	2											
2	1	2	3											
3		2	3		2								-	
4		3	2		1						-		-	
5		1	2	-	3								-	

8 Hours

UNIT I

INTRODUCTION TO USABILITY

Introduction-Growth of usability - A bit of Jargon - Human Factors - Human/Computer Interaction - User-Centered Design - Things End up Unusable - Checklist - Human Factors - Human Factors Psychology - Sensation and Perception-Version - Hearing and Speech - Sensory Adaptation - Memory - Cultural Factors- Implication for Design

UNIT II **10 Hours**

USER-CENTERED DESIGN AND USABILITY AWARE DESIGN

User-Centered Design (UCD) - UCD standards -Process of UCD - Capturing User Input - Life Cycle- On Impartiality - Moderator's Frame -Disease of Familiarity - Population versus Sample - Participant -Ethics - Cycle of Design and Evaluation - Usability and Accessibility - Guidelines for Framework

UNIT III **10 Hours**

ACCESSIBILITY AND UNDERSTANDING USERS

Accessibility - Principles - Using CSS - Other Considerations - Assistive Technology - Mobile Computing and Accessibility - Organizational Goals - Strategic versus Tactical Planning - User Profiles - Types of User Information

UNIT IV **8 Hours**

METRICS AND HEURISTIC EVALUATION

Four Common Metrics - ANSI NCITS - Usability Metrics for Masses - Six Sigma - SUM - Usability Magnitude Estimation and Master Usability Scaling - 10 Usability Heuristics - Heuristics for Web - Evaluation Methodology - Environment - Process - Assembling Data - Measures

UNIT V **9 Hours**

USABILITY TESTING AND TECHNIQUES

Usability Lab - Writing Test Plan - Designing Usability Tasks - Card Sort - Interview - Survey - Prototyping - Field Study - Automated Session - Focus Group - Thinking Aloud - Walk-up Kiosk - Opinion Polls

FOR FURTHER READING

Test Goals - Getting Test Users - Choosing Experimenters - Ethical Aspects of Test with Human Subjects - Test Tasks - Stages of a Test - Performance Measurement - Reliability - Validity

Total: 45 Hours

Reference(s)

1. Mark Pearrow, "Web Usability", Second Edition, Charles river media, 2013
2. Russ Unger, Carolyn Chandler, "A Project Guide to UX Design", Second Edition, Pearson Education, 2012
3. Rubin J, Chisnell. D, "Handbook of Usability Testing", Second Edition, Wiley Press, 2008

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4		4			4	4																		16
2	2		4								4			3	4										17
3		3				3	3				4			4				2	4						23
4	3					8				4				4	2				4						25
5							4				8				4			3							19
Total																									100

Assessment Questions

Remember

1. What is usability engineering?
2. State Jargon theory.
3. List the ten Usability Heuristics.
4. Mention the different types of User Information.
5. Mention any four Cultural Factors.
6. List out the UCD standard in usability engineering.
7. Define Assistive Technology.
8. Expand
   a.ANSI
   b.NCITS
9. Define Automated Session.
10. List out the steps that benefits Designing Usability Tasks

Understand

1. List out the human factors in usability engineering.
2. Mention the purpose of User-Centered Design.
3. Compare Sensation and Perception.
4. Identify the Human Factors Psychology in usability engineering.
5. What is Sensory Adaptation?
6. Write the different types of Cultural Factors.
7. Explain in detail about life cycle of UCD.
8. Why we need UCD?
9. Specify the uses of UCD standards.
10. Why wE need Automated Session?
11. Discuss in detail about Tactical Planning.
12. Goals of usability testing:
    A) Performance
    B) Accuracy
    C) Recall -- How much does the person remember afterwards or after periods of non-use?
    D) All of above

Apply

1. Exemplify the concept of Walk-up Kiosk.
2. Discuss the role of Evaluation Methodology for the modern era development.
3. Usability engineering literature differentiates between two types of skilled users - expert and experienced users. We refer to the second group as experienced users, rather than expert users, to acknowledge the fact that they are occasional skilled users. Which of the attributes in Nielsen's definition of usability (listed below) is especially used as a criterion for assessing the effectiveness of user interfaces developed to be used by experienced users?
   A.Learnability
   B.Efficiency
   C.Memorability
   D.Errors
   E.Subjective satisfaction

4. What are the advantages of using questionnaires in usability research?
5. List out the advantages of usability engineering.
6. How do questionnaires fit in with other HCI evaluation methods?
7. How can I tell if a question belongs to a Likert scale or not?
8. Is a high statistical reliability is not the 'gold standard' to aim for?
9. Why do some questionnaires have sub-scales?
10. How do you go about identifying component sub-scales?

Analyse

1. Exemplify the Guidelines for Framework.
2. Write in detail about test plan.
3. Mention the uses of Card Sort.
4. Identify the four Common Metrics.
5. Compare Usability Magnitude Estimation and Master Usability Scaling.
6. Specify the functions used for the Heuristics of Web.
7. How the process of Assembling Data executes?
8. Why we need CSS?
9. Discuss in detail about Strategic Planning.
10. Differentiate Strategic and Tactical Planning.
11. Think about why you will be doing a usability test:
    A) How do people interact with the system you are testing?
    B) What is difficult or easy for people to do?
    C) What makes sense about it? What is exciting about it?
    D) What changes would users like to see?
    E) All of above
12. Usability testing can be carried out at various stages of the design process. In the early stages, however, techniques such as ..... are often more appropriate.
    A) sample tests
    B) SRSs
    C) walkthroughs
    D) Both A & B
13. Write any four Organizational Goals.
14. Which of these is NOT a role in a usability test?
    A.Facilitator
    B.Instructor
    C.Observer
    D.User
15. Formal usability testing involves six stages/activities (listed below). At which stage do you start to think about the users?
    A.Developing the test plan
    B.Selecting and acquiring the participants
    C.Preparing the test material
    D.Conducting the test
    Â

Evaluate

1. Theses methods can help improve the usability and usefulness of your site:
    A) Card Sorting
    B) Favorite Interviews
    C) Focus Groups
    D) Heuristic Evaluation
2. Theses methods can help improve the usability and usefulness of your site:
    A) Card Sorting
    B) Favorite Interviews
    C) Focus Groups
    D) Heuristic Evaluation
3. Theses methods can help improve the usability and usefulness of your site:
    A) Card Sorting
    B) Favorite Interviews
    C) Focus Groups
    D) Heuristic Evaluation
4. Theses methods can help improve the usability and usefulness of your site:
    A) Card Sorting
    B) Favorite Interviews

C) Focus Groups
D) Heuristic Evaluation

5. Theses methods can help improve the usability and usefulness of your site:
   A) Card Sorting
   B) Favorite Interviews
   C) Focus Groups
   D) Heuristic Evaluation
6. Theses methods can help improve the usability and usefulness of your site:
   A) Card Sorting
   B) Favorite Interviews
   C) Focus Groups
   D) Heuristic Evaluation
7. During usability testing, a facilitator should encourage participants to:
   A.Perform the task as quickly as possible
   B.Verbalise what they are thinking as they perform the task
   C.Keep track of all the mistakes they make while using the interface
   D.Perform the task quietly and precisely

Create

1. Rewrite the process flow of User-Centered Design.
2. Design a test plan for automated ATM machine.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT021 E-COMMERCE 3 0 0 3

Course Objectives

- Learn the Various e-commerce business models.
- Understand how companies use e-commerce to gain competitive advantages
- Familiarize with the planning and execution of e-commerce projects

Programme Outcomes (POs)

d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Develop an understanding of the foundations, importance and applications of E-commerce
2. Understand various electronic payment types and the ways to protect against them.
3. Develop innovative new mobile commerce technologies and systems to improve the consumer experience
4. Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational.
5. Discuss legal issues and privacy in E-Commerce

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1				2	1									3
2				2		2					3			
3					1								2	
4					2								1	
5						3							2	

UNIT I **9 Hours**

ELECTRONIC COMMERCE

Frame work, anatomy of E-Commerce applications - E- Commerce Consumer applications - E-Commerce organization applications.

UNIT II **9 Hours**

CONSUMER ORIENTED ELECTRONIC COMMERCE

Mercantile Process models-Electronic payment systems: Digital Token-Based - Smart Cards - Credit Cards - Risks in Electronic Payment systems.

UNIT III **9 Hours**

MOBILE ELECTRONIC COMMERCE

Wireless Industry Standards - Wireless Communication Platforms for LANs - Wireless WANs - Facilitators of a Wireless Environment - Concerns for the Mobile Enterprise.

UNIT IV **9 Hours**

E-COMMERCE APPLICATIONS DEVELOPMENT

The Changing Face of Application Development - Enterprise Development Needs - Enhanced Web Server-Based E-Commerce Site Business Objectives - Categories of Business Value - Assessing a Site's Current Business Value - Improving Business Value - Managed Solutions.

UNIT V **9 Hours**

E-COMMERCE SECURITY

Types of Security Technologies: The Internet - The Internet Is Big Business - The New Economy - Where Old Meets New - Flawed Infrastructure - Emergence of Cyber Crime - Outside Attacks - Inside Attacks - Threats Due to Lack of Security - Cyber Security Need - Internet Security Education - E-Commerce Application Security Technology Essentials.

FOR FURTHER READING

Security Issues in E-Commerce - Social media and Online Retailing - Interaction Design for E-Commerce Websites.

Total: 45 Hours

Reference(s)

1. Ravi Kalakota, Andrew B Whinston, Frontiers of Electronic Commerce, Pearson, 2013.
2. Pete Loshin, Ohn Vacca ,Electronic Commerce, fourth edition, Firewall Media, 2005.
3. Efraim Turban ,Electronic Commerce, fourth edition, Pearson, 2006.
4. Jeffrey F Rayport, Bernard J Jaworski , Introduction to E-Commerce, second edition, Tata McGraw Hill, 2003.
5. Gary P Schneider ,E-commerce: Strategy, Technology and Implementation, eleventh edition, Cengage Learning, 2011.
6. Kamlesh K Bajaj, Debjani Nag ,E-Commerce: The Cutting Edge of Business, second edition, Tata McGraw Hill, 2005.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2		3			2				3	2		4												16
2	3	2				2	4		4	5				4	3			2							29
3		2				3	4		4	2	3			5	3			3							29
4			4		2					7					3										16
5					4						6														10
Total																									100

Assessment Questions

Remember

1. Define electronic commerce
2. List the various components of electronic commerce applications

3. What is the role of agents for B2B EC?
4. What is the importance of JIT delivery in B2B E-commerce?
5. List the benefits & limitations of E-commerce
6. What are the characteristics of internet-based EDI?
7. What is an electronic payment system?
8. What is the use of hypertext links in Internet access?
9. What do you understand by WWW?
10. What are the concerns for growth of e-commerce in India?

Understand

1. Who are the stakeholders in E-Commerce information system? Explain the benefits and limitations of E-commerce
2. Explain the role of Software Agents in E-Commerce
3. Describe the functional requirements for online selling and what specialized services and servers perform these functions
4. Explain Internet, intranet, extranet and their usage and benefits in today's organization settings
5. With the help of any example web site explain the perspectives of the buyers and sellers in a B2B Ecommerce web site
6. Explain the different steps involved in the development of an e-commerce web site.
7. What is E-shopping? What are the advantages and disadvantages of e-shopping?
8. Discuss the various threats involved in client server communications and how are they encountered in EC business
9. Discuss the different online marketing strategies in EC
10. Write notes on following:
    a. Content Marketing
    b. Digital Certificate

Apply

1. Once a company has acquired customer, the key to maximizing revenue is keeping them. Explain how e-commerce is helpful in customer retention?
2. Give examples of how the supplier's information system can be used at every link in the value chain by the customer?
3. Does Internet access make employees more or less productive? Give an example
4. Why do you think the travel industry's Internet growth potential is so great?
5. Why do you think web-based firms report more security breaches than other companies?
6. Exemplify a major paradigm change that is occurring in one industry due to the Internet.
7. Explain B2B E-Commerce using an example of a book distributor who stocks a large number of books, which he distributes via a large network of book sellers. Assume that the distributor has stocks of books of a large number of publishers and book sellers order books as and when their stock is low. Distributors give 1 month's time to booksellers for payment
8. If internet is to be used for EDI which mail standard is used?
9. If email is to be used to exchange EDI between two businesses what are the points on which they should agree?
10. What special precautions should be taken by a bank to ensure that a customer does not double spend the same electronic coins issued to him/her?

Analyse

1. Compare and contrast the traditional business with electronic commerce
2. What is e-payment? Why is orientation and standardization required for e-payment businesses?
3. Analyze the ethical, social and political issues in E-Commerce.
4. How Internet based advertising is capable of competing with commercial advertising?
5. Distinguish between passive and active advertising methods
6. Compare Hypertext versus hypermedia

7. What is the difference between intranet and extranet?
8. Compare and contrast the traditional business with electronic commerce in a book shop business
9. Compare different advertising strategies online
10. Why is orientation and standardization required for e-payment businesses? [

Create

1. Discuss the case study in online service industry perspective
2. Discuss about social media impact on e commerce

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT022 ENTERPRISE RESOURCE PLANNING 3 0 0 3

Course Objectives

- Impart knowledge on Enterprise Resource Planning fundamentals
- learn function and Technical Specification in business application development
- Implementation of business application in cloud platform

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Understand the concept of Enterprise Resource Planning and Functional Modules in developing ERP Package for various Industries
2. Analyze the Implementation Process of ERP in different verticals of business Process and its Risk Factors
3. Apply ERP concepts on e-commerce, process management and Implementation ERP package for large scale Industries

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	3											
2	1	2												
3	2	1	1											

UNIT I **9 Hours**

INTRODUCTION

Enterprise overview-Business Process-Need for ERP Information System perspective of ERP System-Basic ERP Concepts - Role of ERP - Challenges-ERP Investments -Risk of ERP - Benefits of ERP-ERP Technologies - Security.

UNIT II **9 Hours**

ERP MARKET PLACE AND FUNCTIONAL MODULES

Overview- Market Tiers-Market Place Dynamics-Market Size and Forecast-Opportunities - ERP System- Functional Modules-Material Management - Sales and Distribution - Financial System - Integration.

UNIT III **9 Hours**

ERP IMPLEMENTATION

Basic Implementation-Life Cycle-Package Selection-Transition Strategies-Deployment Models-Implementation Process-ERP Project Teams-Consultants, Vendors and Employees-success and Failure factors-operation and maintenance - Maximizing ERP System.

UNIT IV **9 Hours**

ADVANCED ERP SYSTEMS- BUSINESS PROCESS REENGINEERING

Advanced ERP System- Supply Chain Management - Customer Relationship Management - Logistics Management-Business Process - Lifecycle-Tools and Technologies - Success and Failure Factors in implementing-Data Collection Methods-BP Mapping Tools.

UNIT V **9 Hours**

E COMMERCE AND ARCHITECTURE

e-Commerce concepts-Sales life cycle model- Technological Infrastructure- e-commerce Applications-Rise of M commerce -ERP Architecture - Evolution - Types - Platforms-Process and Strategies-Risk Analysis.

FOR FURTHER READING

ERP Systems - ERP on Cloud Computing Model-e-Commerce -Development- Implementation-Business process Reengineering

Total: 45 Hours

Reference(s)

1. D. P. Goyal, Enterprise Resource Planning The Managerial Perspective, Tata McGraw Hill Private Ltd,2011.
2. Alexis Leon,Enterprise Resource Planning , Tata McGraw Hill Educations Pvt Ltd,2014.
3. Ellen F.Monk , Concepts in Enterprise Resource Planning, Fourth Edition, CourseTechnology Cengage Learning 2012
4. Rajesh Ray , Enterprise Resource Planning -Test and Cases , Tata McGraw Hill Educations Pvt Ltd,2011.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	4			2	6								2											18
2		2	2			6			2				8												20
3	2	2			4	2	2			6			4												22
4		2					2			6				6							4				20
5	2		4			2							4				4				4				20
Total																									100

Assessment Questions

Remember

1. What are the Reasons for the Growth of ERP market?
2. Define ERP
3. Define Vendor

4. Define Gap analysis
5. What are the subsystems in an Manufacturing Module?
6. What are the Business modules present in an ERP package
7. What are the subsystems in an Sales and distribution Module.
8. What are the Phases in BPR.
9. Explain The subsystems of Plant Maintanence Module.
10. What are the Procedures to be followed in TURBO charge the ERP system

Understand

1. What are the Internet Technologies in ERP.
2. What are the main misconceptions about ERP?
3. What are the limitations of ERP?
4. What are the main characteristics of MIS?
5. Discuss the problem areas in ERP implementation.
6. Explain the solutions offered by QAD.
7. What is process definition and why is it important?
8. Who are Vendors & Consultants? Explain the roles and responsibilities of Vendors & consultants.
9. Briefly describe the various phases of ERP implementation lifecycle?
10. What are the different types of metrics in performance?

Apply

1. Discuss the Industrial impact of ERP in post implementation.
2. How is Supply Chain Management (SCM) integrated with Customer Relationship Management (CRM)
3. Explain the different phase of BPR details.
4. What are Ten Mistakes to be avoided in Data Warehousing project
5. write short notes on 1)Vendors
   2)Consultants
   3)End Users
6. Explain in detail about the Issues to be consider in planning design and implementation of cross functional integrated ERP systems
7. What are the Different Business Units in the Peoplesoft.
8. What are the Different Product modules available in JD-EDWARD?
9. What are the mySAP Business Suite currently comprises?
10. What are the Basic Functions in an Sales order Processing.

Analyse

1. Differentiate ERP and E-Commerce.
2. What are the Merits and Demerits in Baan?
3. Write in details about Organizational impact of Implementation.
4. Discuss the roles and importance of CRM in today's business environment
5. Briefly explain the E-Commerce and E-Business.
6. Why ERP implementation in challenging?
7. Why is the pre-evaluation screening required?
8. What are the Different Business Units in the Peoplesoft.
9. What are the six Categories in an ORACLE application?
10. What are the Different Product modules available in JD-EDWARD.

Create

1. Design ERP package for a school system by considering from enrollment to the completion of school .
2. Create an ERP module for call taxi mantainance and their travel desk.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT023 COMPREHENSION 3 0 0 3

Course Objectives

- Understand the basic concepts related to mathematical and computational theory.
- Relate the mathematical concepts with Computational concepts.
- Demonstrate the Computational concepts with case studies.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. Recall the basic concepts related to mathematical and computational theory.
2. Appear for Graduate Aptitude Test in Engineering (GATE), National Eligibility Test (NET), State Eligibility Test (SET), Indian Engineering Services (IES), Indian Technical Services (ITS), Railway Recruitment Board (RRB).

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2					-							
2	2													

UNIT I **15 Hours**

ENGINEERING MATHEMATICS

Section 1: Engineering Mathematics

Discrete Mathematics: Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Groups. Graphs: connectivity, matching, coloring.

Combinatorics: counting, recurrence relations, generating functions.

Linear Algebra: Matrices, determinants, system of linear
equations, eigenvalues and eigenvectors, LU decomposition.
Calculus: Limits, continuity and differentiability. Maxima and minima. Mean value theorem. Integration.

Probability: Random variables. Uniform, normal, exponential, poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.

UNIT II **10 Hours**

DIGITAL LOGIC AND COMPUTER ORGANIZATION

Section 2: Digital Logic

Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic(fixed and floating point).

Section 3: Computer Organization and Architecture

Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface(interrupt and DMA mode).

UNIT III **10 Hours**

DATA STRUCTURES AND ALGORITHM

Section 4: Programming and Data Structures

Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

Section 5: Algorithms

Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide and conquer. Graph search, minimum spanning trees, shortest paths.

UNIT IV **10 Hours**

COMPILER DESIGN

Section 6: Theory of Computation

Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and contex-free languages, pumping lemma. Turing machines and undecidability.

Section 7: Compiler Design

Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation.

UNIT V **5 Hours**

OPERATING SYSTEMS

Section 8: Operating System Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems.

UNIT VI **5 Hours**

FOR FURTHER READING

Section 9: Databases

ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

UNIT VII **7 Hours**

COMPUTER NETWORKS

Section 10: Computer Networks

Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols(DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.

Total: 62 Hours

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1		2									10				5										17
2						4					5				10										19
3															5				10			6			21
4						4					5								10						19
5		4									10				6			4							24
6																									0
7																									0
Total																									100

Assessment Questions

Remember

1. The worst case time complexity of AVL tree is better in comparison to binary search tree for
   (A) Search and Insert Operations
   (B) Search and Delete Operations
   (C) Insert and Delete Operations
   (D) Search, Insert and Delete Operations
2. In which addressing mode, the effective address of the operand is generated by adding a constant value to the contents of register?
   (A) Absolute
   (B) Indirect
   (C) Immediate
   (D) Index
3. In which tree, for every node the height of its left sub tree and right sub tree differ almost by one?
   (A) Binary search tree
   (B) AVL tree
   (C) Threaded Binary Tree
   (D) Complete Binary Tree
4. The design issue of Data link Layer in OSI Reference Model is
   (A) Framing
   (B) Representation of bits
   (C) Synchronization of bits
   (D) Connection control
5. The problem of indefinite blockage of low-priority jobs in general priority scheduling algorithm can be solved using:
   (A) Parity bit
   (B) Aging
   (C) Compaction
   (D) Timer
6. Which of the following memory allocation scheme suffers from external fragmentation?
   (A) Segmentation
   (B) Pure demand paging
   (C) Swapping
   (D) Paging
7. The maximum number of keys stored in a B-tree of order m and depth d is
   (A) md + 1 – 1
   (B) (md+1 – 1) / (m – 1)
   (C) (m – 1) (md + 1 – 1)
   (D) (md – 1)/(m – 1)

8. The technique of temporarily delaying outgoing acknowledgements so that they can be hooked onto the next outgoing data frame is known as
   (A) Bit stuffing
   (B) Piggy backing
   (C) Pipelining
   (D) Broadcasting
9. Everything below the system call interface and above the physical hardware is known as _____.
   (A) Kernel
   (B) Bus
   (C) Shell
   (D) Stub
10. Which is not the correct statement?
    (A) The class of regular sets is closed under homeomorphisms.
    (B) The class of regular sets is not closed under inverse homomorphism.
    (C) The class of regular sets is closed under quotient.
    (D) The class of regular sets is closed under substitution.

Understand

1. Given the following expressions of a grammar
   E -> E * F / F + E / F
   F -> F – F / id
   Which of the following is true?
   (A) * has higher precedence than +
   (B) – has higher precedence than *
   (C) + and – have same precedence
   (D) + has higher precedence than *
2. Which of the following features will characterize an OS as multi programmed OS?
   (a) More than one program may be loaded into main memory at the same time.
   (b) If a program waits for certain event another program is immediately scheduled.
   (c) If the execution of a program terminates, another program is immediately scheduled.
   (A) (a) only
   (B) (a) and (b) only
   (C) (a) and (c) only
   (D) (a), (b) and (c) only
3. You are given an OR problem and a XOR problem to solve. Then, which one of the following statements is true?
   (A) Both OR and XOR problems can be solved using single layer perception.
   (B) OR problem can be solved using single layer perception and XOR problem can be solved using self-organizing maps.
   (C) OR problem can be solved using radial basis function and XOR problem can be solved using single layer perception.
   (D) OR problem can be solved using single layer perception and XOR problem can be solved using radial basis function.
4. In classful addressing, an IP address 123.23.156.4 belongs to _____ class format.
   (A) A
   (B) B
   (C) C
   (D) D
5. 58 lamps are to be connected to a single electric outlet by using an extension board each of which has four outlets. The number of extension boards needed to connect all the light is
   (A) 29
   (B) 28
   (C) 20
   (D) 19
6. Which of the following flags are set when ‘JMP’ instruction is executed?

(A) SF and CF
(B) AF and CF
(C) All flags
(D) No flag is set

7. The power set of AUB, where A = {2, 3, 5, 7} and B = {2, 5, 8, 9} is
   (A) 256
   (B) 64
   (C) 16
   (D) 4
8. Suppose a processor does not have any stack pointer registers, which of the following statements is true?
   (A) It cannot have subroutine call instruction.
   (B) It cannot have nested subroutine calls.
   (C) Interrupts are not possible.
   (D) All subroutine calls and interrupts are possible.
9. When a programming Language has the capacity to produce new data type, it is called as,
   (A) Overloaded Language
   (B) Extensible Language
   (C) Encapsulated Language
   (D) Abstraction Language
10. Which of the following regular expression identities are true?
    (A) (r + s)* = r* s*
    (B) (r + s)* = r* + s*
    (C) (r + s)* = (r*s*)*
    (D) r* s* = r* + s*

Apply

1. If the disk head is located initially at 32, find the number of disk moves required with FCFS if the disks queue of I/O blocks requests are 98, 37, 14, 124, 65, 67.
   (A) 239
   (B) 310
   (C) 321
   (D) 325
2. Given memory partitions of 100 K, 500 K, 200 K, 300 K and 600 K (in order) and processes of 212 K, 417 K, 112 K, and 426 K (in order), using the first-fit algorithm, in which partition would the process requiring 426 K be placed?
   (A) 500 K
   (B) 200 K
   (C) 300 K
   (D) 600 K
3. Suppose that someone starts with a chain letter. Each person who receives the letter is asked to send it on to 4 other people. Some people do this, while some do not send any letter.
   How many people have seen the letter, including the first person, if no one receives more than one letter and if the chain letter ends after there have been 100 people who read it but did not send it out? Also find how many people sent out the letter?
   (A) 122 & 22
   (B) 111 & 11
   (C) 133 & 33
   (D) 144 & 44
4. A hash function f defined as f (key) = key mod 13, with linear probing is used to insert keys 55, 58, 68, 91, 27, 145. What will be the location of 79?
   (A) 1
   (B) 2
   (C) 3
   (D) 4

5. Consider a system having m resources of the same type. These resources are shared by 3 processes A, B and C which have peak demands of 3, 4 and 6 respectively. For what value of m deadlock will not occur?
   (A) 7
   (B) 9
   (C) 10
   (D) 13
6. Consider the program below in a hypothetical programming language which allows global variables and achoice of static or dynamic scoping int i;
   program Main( )
   {
   i = 10;
   call f ( );
   }
   procedure f( )
   {
   int i = 20; call g ( );
   }
   procedure g( )
   {
   print i; }
   Let x be the value printed under static scoping and y be the value printed under dynamic scoping. Then x and y are
   (A) x = 10, y = 20
   (B) x = 20, y = 10
   (C) x = 20, y = 20
   (D) x = 10, y = 10
7. A program P calls two subprograms P1 and P2. P1 can fail 50% times and P2 40% times. Then P can fail
   (A) 50%
   (B) 60%
   (C) 10%
   (D) 70%
8. If the Fourier transform of the function f(x, y) is F(m, n), then the Fourier transform of the function f(2x, 2y) is:
   (A) 1/4 F(m/2 , n/2)
   (B) 1/4 F (2m, 2n)
   (C)1/4 F (m, n)
   (D) 1/4 F (m/4 ,n/4)
9. Suppose that a given application is run on a 64-processor machine and that 70 percent of the application can be parallelized. Then the expected performance improvement using Amdahl's law is
   (A) 4.22
   (B) 3.22
   (C) 3.32
   (D) 3.52
10. While unit testing a module, it is found that for a set of test data, maximum 90% of the code alone were tested with a probability of success 0.9. The reliability of the module is
    (A) atleast greater than 0.9
    (B) equal to 0.9
    (C) atmost 0.81
    (D) atleast 1/0.81

Analyse

1. The Mobile Application Protocol (MAP) typically runs on top of which protocol?
   (A) SNMP (Simple Network Management Protocol)

(B) SMTP (Simple Mail Transfer Protocol)
(C) SS7 (Signalling System 7)
(D) HTTP (Hyper Text Transfer Protocol)

2. The number of bit strings of length eight that will either start with a 1 bit or end with two bits 00 shall be
   (A) 32
   (B) 64
   (C) 128
   (D) 160
3. Match the following IC families with their basic circuits:
   a. TTL 1. NAND
   b. ECL 2. NOR
   c. CMOS 3. Inverter
4. Which level of Abstraction describes what data are stored in the Database?
   (A) Physical level
   (B) View level
   (C) Abstraction level
   (D) Logical level
5. X.25 is _____ Network.
   (A) Connection Oriented Network
   (B) Connection less Network
   (C) Either Connection Oriented or Connection Less
   (D) Neither Connection Oriented nor Connection Less

Evaluate

1. Using RSA algorithm, what is the value of cipher text C, if the plain text M = 5 and p = 3, q = 11 & d = 7?
   (A) 33
   (B) 5
   (C) 25
   (D) 26
2. Which of the following permutations can be obtained in the output using a stack of size 3 elements assuming that input, sequence is 1, 2, 3, 4, 5?
   (A) 3, 2, 1, 5, 4
   (B) 5, 4, 3, 2, 1
   (C) 3, 4, 5, 2, 1
   (D) 3, 4, 5, 1, 2
3. The number of distinct bracelets of five beads made up of red, blue, and green beads (two bracelets are indistinguishable if the rotation of one yield another) is,
   (A) 243
   (B) 81
   (C) 51
   (D) 47
4. In an enhancement of a CPU design, the speed of a floating point unit has been increased by 20% and the speed of a fixed point unit has been increased by 10%. What is the overall speed achieved if the ratio of the number of floating point operations to the number of fixed point operations is 2 : 3 and the floating point operation used to take twice the time taken by the fixed point operation in original design?
   (A) 1.62
   (B) 1.55
   (C) 1.85
   (D) 1.285
5. In an image compression system 16384 bits are used to represent 256 × 256 image with 256 gray levels. What is the compression ratio for this system?
   (A) 1
   (B) 2

(C) 4
(D) 8

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT024 INFORMATION STORAGE MANAGEMENT

3 0 0 3

Course Objectives

- Understand the functionalities of logical and physical components of a storage
- Describe storage networking technologies and Identify different storage virtualization technologies
- Explain common storage management activities and solutions

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Effectively apply the fundamentals of information storage management
2. Identify optimized storage technologies that provide cost-effective IT solutions for medium to large scale
3. Manage virtual servers and storage between remote locations
4. Identify the various models involved in the services and deployment of Cloud infrastructure.
5. Infer the security needs and security measures to be employed in information storage management

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3		2					1			2	
2	2	1		-										
3	1	3	2		-	2					1			
4	1	1	-				2							
5	2					2	-							

UNIT I **8 Hours**

STORAGE SYSTEMS

Introduction to information storage, Virtualization and cloud computing, Key data center elements, Compute, application, and storage virtualization, Disk dive & flash drive components and performance, RAID, Intelligent storage system and storage provisioning (including virtual provisioning)

UNIT II **10 Hours**

STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION

Fibre Channel SAN components, FC protocol and operations, Block level storage virtualization, iSCL and FCIP as an IP-SAN solutions, Converged networking option-FcoE, Network Attached Storage (NAS)-components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.

UNIT III **12 Hours**

BACKUP, ARCHIVE AND REPLICATION

Business continuity terminologies, planning and solutions, Clustering and multipathing to avoid single points of failure, Backup and recovery methods, targets and topologies, data deduplication and backup in virtualized environment, fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.

UNIT IV **5 Hours**

CLOUD COMPUTING CHARACTERISTICS AND BENEFITS

Services and deployment models, Cloud infrastructure components, Cloud migration considerations.

UNIT V **7 Hours**

SECURING AND MANAGING STORAGE INFRASTRUCTURE

Security threats, and countermeasures in various domains, Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments-Monitoring and managing various information infrastructure components in classic and virtual environments.

UNIT VI **3 Hours**

FOR FURTHER READING

Information lifecycle Management (ILM) and storage tiering

Total: 45 Hours

Reference(s)

1. Information Storage and Management: Storing, Managing and Protecting Digital Information in classic, Virtualized and Cloud Environments, 2nd Edition, EMC Educations Services, Wiley, May 2012.

2. IBM, Introduction to Storage Area Networks and System Networking Fifth Edition, November 2012.
3. Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein ,"Storage Networks

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	3				1	2			5						2			3					4		20
2		4				2				2			1	3			4					3			19
3	4		2		3						3				3		1		2			2			20
4		3			2	2			2	2			3	2			2				2				20
5	2		2		2		2			2	2				2		2	3			2				21
6																									0
Total																									100

Assessment Questions

Remember

1. What do you mean by digital data?
2. Which parameter accelerated data growth by storing all types of data, coupled with individual and business needs?
3. What process facilitates access to a specific document from different locations?
4. Which part of the disk is used to mount the R/W head?
5. Indicate the range of average seek time on a typical modern disk?
6. Identify the reasons for the head crash.
7. What do you mean by External data trasnfer rate?
8. Define data trasnfer rate.
9. Define the need of comand queing.
10. What property describes a landing zone in a disk drive?
11. Which process minimizes the exposure to a loss of uncommitted cached data when there is a power failure?.Explain in detail.
12. Represesnt the base layer of the cloud services stack.
13. What do you mean by Big Data?

Understand

1. Identify the category of the following data "Various aspects of inventory, description, pricing, availability and sales data".
2. What do you mean by cache dirty bit flag?
3. State the process of partitioning a physical disk.
4. A disk drive has a rotational speed of 100 revolutions per second. Calculate is the average rotational latency?
5. Define Internal data transfer rate
6. What is characxtersitic nature of parity-based RAID
7. The midrange storage systems have been implemented with_____
8. Identify the process which allows grouping of two or more physical NICs and treating them as a single logical device?
9. What is the difference between a restore operation and a resynchronization operation with local replicas?
10. Explain in detail about Fiber Channel Protocol Stack?
11. Mention the key considerations for cloud adoption.
12. Identify the list of reasons which push for opting cloud computing storage.

Apply

1. Which device is used to connected directly to the host and the storage device?
2. Which process enables creating and presenting a LUN with more capacity than physically allocated to it on storage array?
3. What is RAID? Explain the three types ofÂ RAID techniques and explain how they are classified as RAID 0,1,3,4,5,6 with a neat sketch.
4. In the context of vulnerabilities in a storage network, what does the attack surface describe?
5. Explain how information storage security framework is palying a vital role in the storage industry.
6. Compare authorization and authenthication process.
7. Explain the challenges faced in maintaining the Information & it's scope ?
8. Explain the key parameters in managing storage infrastructure to ensure continuity of business?

Analyse

1. Which cache management algorithm is based on the assumption that data will not be requested by the host when it has not been accessed for a while?Explain in detail.
2. List the problems prevented using RAID technology.
3. Time to resume application operations must equal to 2 hours. Justify this statement if the recovery-point objective (RPO) of an application is 2 hours?
4. How do Business Continuity and Disaster Recovery Differ?
5. How does clustering help to minimize RTO?
6. There are limited backup devices in a file sharing NAS environment. Suggest a suitable backup implementation that will minimize the network traffic, avoid any congestion, and at the same time not impact the production operations. Justify your answer.
7. An administrator configures six pointer based virtual replica of a LUN and creates eight full volume replica of the same LUN. The administrator then creates four pointer based virtual replica for each full volume replica that was created. How many usable replicas are now available?
8. What are the cloud challenges for consumers?
9. List the types of software used in cloud management and service creation tools layer.
10. What are the two mechanisms can be used to obtain unauthorized administrator access?

Evaluate

1. Represesnt expression represents availability of a system in terms of MTBF and MTTR?

2. What is the minimum number of storage volumes required in the cascade/ multihop (synchronous +disk buffered) three-site replication?

3. A network router has a failure rate of 0.02 percent per 1,000 hours. What is the MTBF of that component?
4. A system has three components and requires all three to be operational 24 hours, Monday through Friday. Failure of component 1 occurs as follows:

   Monday = No failure

   Tuesday = 5 a.m. to 7 a.m.

   Wednesday = No failure

   Thursday = 4 p.m. to 8 p.m.

   Friday = 8 a.m. to 11 a.m.

5. Calculate the MTBF and MTTR of component 1
6. Consider a disk I/O system in which an I/O request arrives at the rate of 80 IOPS. The disk service time is 6 ms.
   a.Compute the following:Utilization of I/O controller ,Total response time,Average queue size,Total time spent by a request in a queue
   b.Compute the preceding parameter if the service time is halved

Create

1. A department requires access to the database application from Monday to Friday, 9 AM to 5 PM. Last Thursday at 1 PM the application crashed and it took six hours to fix the problem. Calculate the availability of the application during last week?
2. The IT department of a bank provide customers access to the currency conversion rate table between 9:00 a.m. and 4:00 p.m. from Monday through Friday. It updates the table every day at 8:00 a.m. with a feed from the mainframe system. The update process takes 35 minutes to complete. On Thursday, due to a database corruption, the rate table could not be updated. At 9:05 a.m., it was identified that the table had errors. A rerun of the update was done, and the table was re-created at 9:45 a.m. Verification was run for 15 minutes, and the rate table became available to the bank branches. What was the availability of the rate table for the week in which this incident took place, assuming there were no other issues?

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT025 CLOUD INFRASTRUCTURE SERVICES 3 0 0 3

Course Objectives

- understand the cloud infrastructure components and Business continuity in cloud computing.
- learn the concept of virtualized Data Center.
- understand the Cloud service models and deployment models.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Course Outcomes (COs)

1. Transform the Classic Data Center to Virtualized Data Center.
2. Create Virtual Machine images and to deploy them on a Cloud.
3. Manage the Cloud infrastructure and its services.
4. choose suitable Cloud model based on customer requirement.
5. Identify the known threats, risks, vulnerabilities and privacy issues associated with Cloud and evolve appropriate safeguards and countermeasures

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2					1							
2	1				3									
3		2				1								
4	1				2									
5			3			1	2	2						

UNIT I **5 Hours**

JOURNEY TO THE CLOUD

Business drivers for cloud computing, Definition of cloud computing, Characteristics of cloud computing as per NIST, Building Cloud Infrastructure, steps involved in transitioning from classic data center to cloud computing environment.

UNIT II **10 Hours**

CLASSIC DATA CENTER (CDC)

Application, DBMS, Compute, Storage and Networking, Object based and Unified storage technologies, Business continuity overview and backup, Replication technologies, CDC Management.

UNIT III **11 Hours**

VIRTUALIZED DATA CENTER (VDC)

Compute, Storage, Network virtualization techniques, Virtual machine components and process of converting physical to VMs, Block and file level storage virtualization, Virtual provisioning and automated storage tiering, VLAN and VSAN, Key network traffic management techniques in VDC, desktop virtualization, Backup and recovery of Virtual Machines(VMs), VM replication and migration technologies Recovery options from total site failure due to disaster.

UNIT IV **9 Hours**

CLOUD COMPUTING AND INFRASTRUCTURE

Cloud services models, Cloud deployment methods, Economics of Cloud, Cloud infrastructure components, Cloud service creation process, Cloud service management process.

UNIT V **10 Hours**

CLOUD SECURITY AND MIGRATION TO CLOUD

Security concerns and counter measures in a VDC and Cloud environment, Governance, Risk, and Compliance aspects in Cloud, Cloud security best practices, Cloud models suitable for different categories of users, Consideration for choosing applications suitable for Cloud, Different phases to adopt the Cloud.

FOR FURTHER READING

Service Portfolio Management Processes, Yahoo Pipes, Google App Engine, Google Infrastructure, Amazon Web Services, Windows Azure Application

Total: 45 Hours

Reference(s)

1. Cloud Infrastructure and Services, Student Guide - EMC Corporation Bangalore 2012.
2. Information Storage and Management. EMC Proven Professional Wiley; Second Edition (2012)
3. Anthony T Velte, 'Cloud Computing: A practical Approach', Tata McGraw Hill, 2009

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2				2	2				2				4	2										14
2		2				4			2	2	2			2	2			4							20
3	4		4		2								1	2	4				4			2			23
4		2				4				4	4				4	2									20
5	1	1					2			4			1	2	4			4	2			2			23
Total																									100

Assessment Questions

Remember

1. When setting up a cloud environment, a company decides to utilize storage virtualization that allows them to abstract multiple disk arrays and present them as a single storage resource. What is the name for this storage virtualization technique?

2. Which network and SAN configuration/administration approaches will change when setting up a cloud infrastructure?
3. Name 4 platforms which are used for large scale cloud computing.
4. Can cloud computing work for any software?
5. Define the terms: Recovery Point Objectives and Recovery Time Objectives.
6. List the 2 types of Replication.
7. List out the characteristic of a guest operating system whose network is configured as a Virtual NAT device.
8. Define VMM in cloud computing.
9. Which two security functions should be delivered by firewalls in a cloud network infrastructure

Understand

1. A software concern would like to leverage cloud computing to provide advanced collaboration services (i.e. video, chat, and web conferences) for its employees but does not have the IT resources to deploy such an infrastructure. Which cloud computing model would best fit the company needs?
2. A company needs to provide IT services to a worldwide customer base utilizing a diverse set of devices. Draw the architecture of the system and which attribute of cloud computing can help the company deliver such services?
3. Four different companies provide Storage as a Service capabilities:
   Company A stores user data in its primary data center in New York and replicates the data to a backup data center also in New York.
   Company B stores user data in its primary data center in Chicago and replicates it to a data center in Atlanta.
   Company C stores user data in its primary data center in Los Angeles and stores replicas in the same data center.
   Company D stores user data in its primary data center in St Louis and does not replicate the data.
   Which company is likely to provide the highest availability? Reveal your answers.
4. Describe in detail about database solutions and Block storage in cloud computing.
5. The enterprise is using a hybrid cloud to deliver data services to the end user. The enterprise is also is using the cloud to deliver data and services to the end user. When the end user interacts with the enterprise application, the enterprise accesses the cloud to retrieve and/or manipulate the data. The enterprise application returns the results to the end user. What is required for enterprise IT services to simplify the process of switching cloud providers?
6. Compare and contrast object based storage technology and Unified storage technology.
7. Sketch and explain the types of replication configurations classified according to the cloud environment.
8. Illustrate the concept of Google app engine with application.
9. Which cloud computing feature allows for server consolidation resulting in increased asset utilization and decreased data center energy needs? Explain with example.
10. Illustrate the applications of classic date center with neat sketch.

Apply

1. A company must perform a complex analysis for a client, and their computer systems do not have the computation capacity to perform this analysis. How can this analysis be completed quickly and cost effectively?
2. A company that provides gift giving advice has leveraged collaborative services in a cloud computing environment to provide on line chat between its employees and customers. As the holiday season approaches, the company is able to easily increase the resources needed in the cloud environment. When the season has ended, the company is able to reduce the resource usage. This allows the company to effectively manage the required computational resources and thereby reduce costs. What type of cloud computing billing model is best fit to this company?
3. A company operates data centers in two different regions. Energy costs for one of the data centers increases during the warmer, summer months. The company already uses server

virtualization techniques in order to consolidate the total number of required resources. How might the company further reduce operating costs at this data center?

4. A company that provides gift giving advice has leveraged collaborative services in a cloud computing environment to provide on line chat between its employees and customers. As the holiday season approaches, the company is able to easily increase the resources needed in the cloud environment. When the season has ended, the company is able to reduce the resource usage. This allows the company to effectively manage the required computational resources and thereby reduce costs. What type of cloud computing billing model is best fit to this company?
5. Data center clouds are formed by connecting two or more data center cloud networks over wide area network. When building such data center clouds, How the telemetry component is mainly responsible for increasing the network latency?
6. A company currently experiences 7 to 10 percent utilization of its development and test computing resources. The company would like to consolidate to reduce the number of total resources in their data center and decrease energy costs. Explain how the desktop virtualization feature of cloud computing allows resource consolidation.
7. A company gathers, stores, manages, and protects data as part of its business. How can it create
   business value from the data using VDC?
8. An enterprise needs highly controlled storage and access to their databases as well as managing the infrastructure for web front ends and other applications. They have a large existing IT infrastructure and they are continually expanding the capabilities. How the IaaS model will satisfy all their current needs and enable them to reduce cost?
9. A company is setting up a cloud environment to host several of their applications. These applications vary in importance and the company wants to ensure that the most business critical
   applications get the most resource. Which solution will help achieve this goal?
10. A construction company has outsourced its IT operations (storage, hardware, servers, networking components, etc.) to a service provider. The service provider owns this equipment and is responsible for running and maintaining it. The construction company pays the service provider on a per-use basis. What type of cloud service is the construction company using?

Analyse

1. Distinguish between financial management and compliance management.
2. What is the difference between cloud computing and computing for mobiles?
3. Is cloud computing mostly for larger or smaller organizations?
4. A company must perform a complex analysis for a client, and their computer systems do not have the computation capacity to perform this analysis. How can this analysis be completed quickly and cost effectively?
5. Differenciate between local and remote replication in cloud.
6. The enterprise is using a hybrid cloud to deliver data services to the end user. The enterprise is also using the cloud to deliver data and services to the end user. When the end user interacts with the enterprise application, the enterprise accesses the cloud to retrieve and/or manipulate the data. The enterprise application returns the results to the end user. What is required to implement the cloud service delivery model?
7. Distinguish between private cloud and community cloud.Â
8. Does network topology play an important role in deciding the success of a Cloud Infrastructure?Â
9. Now that you have migrated existing applications, what else can you do in order to leverage the elasticity and scalability benefits that the cloud promises? What do you need to do differently in order to implement elasticity in your applications?
   Â

Evaluate

1. A company wants to build a test environment to test software updates and new solutions. The environment should mirror the production environment and be secure and inaccessible from outside the company network. The company does not want to invest in infrastructure that may

be idle for a significant amount of time. Check whether the PaaS model will satisfy all these requirements?

2. Can the accelerated migration program be applied to other areas such as Converged Infrastructure? Explain briefly with an example.

Create

1. A company currently experiences 7 to 10 percent utilization of its development and test computing resources. The company would like to consolidate to reduce the number of total resources in their data center and decrease energy costs. How will you offerÂ resource consolidation usingÂ the desktop virtualization feature of cloud computing?.
2. An enterprise wants to take advantage of cloud computing but retain control over the construction and delivery of all cloud-based services. Design aÂ cloud deployment model toÂ meet their needs.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT026 ENTERPRISE RESOURCE PLANNING - BUSINESS APPLICATION PROGRAMMING I

3 0 0 3

Course Objectives

- Understanding the work flow of various components of Enterprise Resource Planning in Industrial environment.
- Design and development of Enterprise Resource Planning (ERP) Applications using Advanced Business Application Programming (ABAP) Language in SAP.
- Develop dictionary objects with global data structure for business process and resource maintenance
- Create reports based on the requirement of the business needs and analyze the ABAP code through code inspector
- Design applications using Screen programming components to develop End to end Enterprise business applications.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Understand the components of SAP architecture and analyze functionalities of Enterprise Resource Planning.
2. Develop Business logic for enterprise applications using ABAP Programming Language.
3. Develop dictionary objects with global data structure for business process and resource maintenance
4. Create reports based on the requirement of the business needs and analyze the ABAP code through code inspector
5. Design applications using Screen programming components to develop End to end Enterprise business applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		3		1		1							
2	2	-	-		1							2		
3	1			-	2		3					2		
4	-		1		2				-			3	-	
5	2		-		2		2				-			

UNIT I **9 Hours**

INTRODUCTION

IT Overview- ERP Basics - SAP Overview- SAP project: ASAP Methods - Project types - System Landscape- SAP Portfolio- Architecture - Login Procedure.

UNIT II **9 Hours**

ABAP/4 WORKBENCH

ABAP Statements -Key words- Data Types -Data Objects-Elementary Data Types-User defined Data types -Write Statement -Control Statements - System Variables-Simple ABAP Programs - Modularization Techniques -Complex data objects.

UNIT III **9 Hours**

ABAP/4 DICTIONARY

Introduction to ABAP Dictionary -Dictionary Objects: domain ?data element - Structure- Table Type- type group - Data base table- Input Check - Performance Analysis- object dependencies- Views - Search helps -Lock objects-Primary Key and Foreign Key -Table Maintenance Generator.

UNIT IV **9 Hours**

REPORTING

Open SQL Statements- Selection Screens - Authorization Check-Classic ABAP Report - Code Inspector - BAPI - BOR - RFC - ALE - ESOA - Web service - Lock Objects - LUW.

UNIT V **9 Hours**

DIALOG PROGRAMMING

Screen Programming - Program Interface - Screen Elements-Error Handling -Subscreens -Menus-TABstrip Control.

FOR FURTHER READING

Exploring Search Helps: Elementary search help - collective search help - append search help.

Total: 45 Hours

Reference(s)

1. ABAP workbench Part-I and Part-II
2. www. sap.com
3. www. help.sap.com
4. www.scn.sap.com
5. www.service.sap.com

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	4			2				6				2												18
2		2				2				6			2								8				20
3	2		2		4	2			2	6			4												22
4	2	2			6				6				4												20
5		2	2		2	2			4				4								4				20
Total																									100

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT027 ENTERPRISE RESOURCE PLANNING - BUSINESS APPLICATION PROGRAMMING II

3 0 0 3

Course Objectives

- Understand the components of Advanced Business Application Programming in business process.
- Develop business applications based on requirements
- To effectively use software for business development

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Apply and Analyze the concept of object oriented programming, inheritance and polymorphism in the business scenarios
2. Design interfaces and events to develop application for the business processes in Manufacturing and Service industries
3. Create custom defined exceptions for business scenarios and handle the system exception to avoid errors at runtime environment
4. Apply and analyze enhancement procedures to upgrade the SAP Function Modules due to the change in business concepts.
5. Design and create web based application that collaborate with existing SAP functional units that scale to World Wide Web.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3		1			-			-			-
2	1	2	3	1	1						-		-	-
3	1	2	2		1			-			-		-	-
4		1	1	1							-		-	-
5		1	3	1		1					-		-	-

UNIT I **9 Hours**

FUNDAMENTALS OF OOABAP

Introduction - UML Diagrams - Classes - Objects - Attributes - Methods - Constructors - Inheritance and Casting: Downcast and upcast - Polymorphism.

UNIT II **9 Hours**

INTERFACE AND EVENTS

Interface and Casting: Local interfaces - Polymorphism using interfaces - Event handling: Events in local classes - Events in local interfaces - Repository objects: Global interfaces and global classes - Design patterns: Singleton pattern - factory classes using friendship - ABAP list viewer

UNIT III **9 Hours**

EXCEPTION HANDLING AND MEMORY MANAGEMENT

Class Builder - Raising exceptions - Advanced exception handling techniques - shared objects - Dynamic Programming: Generic data types - data objects - objects at run time.

UNIT IV **9 Hours**

ENHANCEMENTS

Dictionary elements: Structures and tables - Customer exits: Program exits - menu exits - screen exits - Modifications - Enhancement framework: Explicit/implicit enhancements: SAP functional modules - Global SAP classes - SAP Structures - SAP Subroutines.

UNIT V **9 Hours**

WEB DYNPRO

Introduction to WebDynpro - Architecture - Navigating between views ? View assemblies - Relation between entities - WebDynpro controllers - Binding data - Context mapping - Layouts and User interface elements - Context programming.

FOR FURTHER READING

Business Add-Ins (BAdIs): Classic BAdIs - New BAdIs - Change from classic BAdIs to new BAdIs - Implementations.

Total: 45 Hours

Reference(s)

1. ABAP workbench Part-III and Part-IV
2. www. sap.com
3. www. help.sap.com
4. www.scn.sap.com
5. www..service.sap.com

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	2			2	2			8				2												18
2		4			6				2	8															20
3		4			4				4				6								6				24
4		2				6					6			4											18
5		2				6			8												4				20
Total																									100

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT028 CLOUD COMPUTING 3 0 0 3

Course Objectives

- Understand the systems, protocols and mechanisms necessary to support cloud computing
- Learn the services offered by cloud computing and their challenging security issues

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Course Outcomes (COs)

1. Use best practices in the design and development of elegant and flexible cloud software solutions
2. Transform the classical data center to virtualized data center
3. Analyze the components of cloud computing showing how business agility in an organization can be created
4. Design and implement a novel cloud computing application
5. Identify the known threats, risks, vulnerabilities and privacy issues associated with Cloud and evolve appropriate safeguards and countermeasures

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			1			2								
2	2		2		2									
3			1	2	2	3								
4	1	2	2											
5	2	2	1	3										

UNIT I **9 Hours**

INTRODUCTION

Cloud computing at a glance - historical developments - building cloud computing environments - computing platforms and technologies - elements of distributed computing - technologies for distributed computing.

UNIT II **9 Hours**

VIRTUALIZATION

Characteristics of virtualized environments - taxonomy of virtualization techniques - virtualization and cloud computing - technology examples.

UNIT III **9 Hours**

CLOUD COMPUTING ARCHITECTURE

Cloud reference model - types of clouds - economics of the clouds - open challenges - organizational aspects.

UNIT IV **9 Hours**

COLLABORATING USING CLOUD SERVICES

Email Communication over the Cloud - CRM Management - Project Management-Event Management - Task Management - Calendar - Schedules - Word Processing - Presentation - Spreadsheet - Databases - Desktop - Social Networks and Groupware.

UNIT V **9 Hours**

SECURITY, STANDARDS AND APPLICATIONS

Security in Clouds - Cloud security challenges - Software as a Service Security - Common Standards - The Open Cloud Consortium - The Distributed management Task Force - Standards for application Developers - Standards for Messaging - Standards for Security - End user access to cloud computing - Mobile Internet devices and the cloud.

FOR FURTHER READING

Case study on Amazon, Google and IBM cloud services

Total: 45 Hours

Reference(s)

1. Rajkumar Buyya, Christian Vecchiola and Thamarai Selvi, Mastering Cloud Computing, Morgan Kaufmann, 2013
2. David E.Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.
3. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011
4. John Rittinghouse & James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.
5. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Que Publishing, August 2008
6. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Que Publishing, August 2008

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	4			2	4																			14
2	2				2	4				2				2				2	2			6			22
3	2				2					2				6	3							6			21
4		2			2					2				6	3							6			21
5		4				4				6								4				4			22
Total																									100

Assessment Questions

Remember

1. Define Cloud Computing with example.
2. What are the properties of Cloud Computing?
3. What is the working principle of Cloud Computing?
4. Define Cloud services with example.
5. What are the advantages of cloud services?
6. What are the disadvantages of Cloud Computing?
7. What are the types of Cloud service development?
8. List the companies who offer cloud service development?
9. Mention the other Cloud service development tools.
10. What is precloud computing?

Understand

1. Draw the architecture of Cloud
2. Why is Cloud Computing important?
3. Who get benefits from Cloud Computing?
4. Who shouldn't be using Cloud Computing?
5. List the advantages and disadvantages of cloud service deployment.
6. What are the features of robust Cloud development? Who it offers?
7. Define the term web service with example.
8. What are the issues in web based applications?
9. What are the typical communication used in cloud computing?
10. Give the various schedules in Collaborating on schedule.

Apply

1. How cloud can be used in Event Schedules and Management with an example.
2. What is online collaboration in Collaborating on report?
3. How the online budgeting application can be accomplished?
4. Explain the activities on cloud computing for the corporation?
5. Discuss about the procedures used for Collaborating on calendars, Schedules and task management.
6. How could you make a transition from data center to cloud computing environment?
7. Why backup and recovery is needed for virtual machines (VMs)?
8. How can you develop cloud services in real time in Aneka?
9. How to develop cloud models suitable for different categories of users?
10. Use the procedures to create a spreadsheet application using cloud.
11. How can you develop cloud services in real time?

Analyse

1. Analyze the mapping schedules managing projects.
2. Explain in detail about Centralizing email communication.
3. Who shouldn't use a Web-Based spreadsheet?
4. Develop a Hadoop Environment and generate a Map/Reduce Programming
5. Design Java Application to implement the Google AppEngine.
6. Study of Microsoft Azure and Google Apps Script.
7. Deploy a cloud in an organization of your choice. Also, explain the details.

Evaluate

1. Use Cloud Simulator Aneka Cloud with suitable application
2. What are the benefits of using cloud services? Also mention the difficulties faced by the users while using cloud services.
3. Enumerate the benefits of cloud computing when compared to traditonal methods of storage. Explain with an appropriate example.

Create

1. Create a Cloud Based Software as a service(SAAS)
2. Create a customized virtualized Desktop applications.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT029 CLOUD MANAGEMENT ESSENTIALS 3 0 0 3

Course Objectives

- Familiarize students with the practical aspects of IaaS (Infrastructure as a Service) cloud computing model
- Familiarize students with the installation and configuration procedure of compute, storage and networking components of openstack platform for establishing enterprise private cloud
- Familiarize students with python programming environment enable them to analyze openstack source code from github

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Design the basic environment required for openstack implementation and configure keystone service for authentication and glance service for managing cloud vm images authentication and glance service for managing cloud vm images
2. Install and configure compute service and neutron service for creating Infrastructure as the Service(IaaS) cloud platform
3. Write scripts in python environment and analyze the python implementation of glance and nova api
4. Manage cloud resources and deliver virtual machines to end users through dashboard and Command Line Interface(CLI) commands
5. Configure block storage service, object storage service and metering service for managing private cloud environment

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2										2	
2	1		2		3								3	
3	1		2		3								1	
4	1		2		3								3	
5	1		2		3								3	

UNIT I **9 Hours**

OPENSTACK ENVIRONMENT

Introduction to Cloud Computing - Openstack Architecture - Basic Requirements - Configuring Identity service - Configuring keystone and its dataset - Image service - Managing Glance.

UNIT II **9 Hours**

OPENSTACK COMPUTE AND NETWORKING

Compute service - Installing Nova with its API - Managing security groups - Networking service - Managing neutron services - VLAN Manager networking.

UNIT III **9 Hours**

PYTHON SCRIPTING

Introduction to Python - Data type- Control Flow Tools - Function - module - File I/O - Classes - Exception Handling - Databases, Network services. Case Study: Glance API - Nova Compute

UNIT IV **9 Hours**

DASHBOARD AND STORAGE CONFIGURATION

Dashboard Service - Horizon Installation - GUI Management and Maintenance - Block Storage Component - Cinder - Snapshot management

UNIT V **9 Hours**

ORCHESTRATION AND TELEMETRY SERVICES

Orchestration service - Telemetry service- Launch VM instances

FOR FURTHER READING

Containers and Docker Services

Total: 45 Hours

Reference(s)

1. Dan Radez, OpenStack Essentials, PackT publishing, 2015
2. Omar Khedhar, "Mastering Openstack", PackT Publishing, 2015
3. docs.openstack.org

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	2					8				8														20
2			4			4	4				8														20
3						6				6	8														20
4							8				12														20
5						5	5				10														20
Total																									100

Assessment Questions

Remember

1. How do you list the OpenStack services and their end points from command prompt of controller node? Illustrate with necessary commands.
2. What exactly happens when you source keystonerc_admin file from the command prompt?
3. Define logical volume manager (LVM) in linux environment.
4. State the steps involved in enabling root access via ssh.
5. List the functionality of publicurl, Internalurl and adminurl parameters of compute service API endpoints.

Understand

1. Differentiate between the two network modes available in the openstack environment with respect to the network design aspects.
2. Why is LVM (Logical Volume Manager) perferred when compared to Manual Partitioning?
3. Differentiate between glance-api and glance-registry components of OpenStack image service.
4. While installing glance, inorder to populate image service database we issue ` su -s /bin/sh -c "glance-manage db_sync" ` command. Interpret the su, /bin/sh and glance_manage.
5. Differentiate between OpenStack networking plug-ins and agents.

Apply

1. Illustrate how SNAT allows traffic from private network to go out to the internet.
2. How do we upload an image to OpenStack image service with public visibility to enable access to all projects? Provide the necessary command.
3. How do you ensure that nova-conductor, nova-console and nova-scheduler components are successfully registered and enabled? Provide the necessary commands.
4. How do you determine whether your compute node support hardware acceleration for virtual machines?
5. What are iptables? How to install iptables on ubuntu server?

Analyse

1. Object storage (swift) of openstack environment, to the extent possible, stores the replica of a data in different zones rather than on a same zone. Why is it so?
2. Ceilometer uses mongoDB database to store telemetry data and it is generally preferred to configure mongoDB to store data in a seperate partition rather than on a root disk. Why is it so?
3. Operating system kernel images are in most cases files residing on appropriate file systems, but the concept of a file system is unknown to the BIOS. Thus, in BIOS-based systems, the duty of a boot loader is to access content of those files, so it can be read from the hard disk, loaded into the RAM, and executed. One of the possible approaches for boot loaders is to load the kernel images by directly accessing hard disk sectors occupied by the actual kernel image, without understanding the underlying file system. Another approach is to make a boot loader aware of the underlying file systems, so kernel images are configured and accessed using their actual file paths. Compare these two approaches and explain the approach used by the GRUB.
4. Assume that you are the manager of an enterprise and you task is to choose between cloudstack and openstack for private cloud deployment. How would you go about choosing the right technology

Create

1. Identity the scheduler part of nova from its source code and implement a new scheduling algorithm by modifying the nova code.
2. Analyze the hashing algorithm used in openstack object storage and implement a new algorithm which would improve the data retrieval efficiency for geographically distributed storage systems.

1
Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT030 ENTERPRISE SYSTEM PROGRAMMING 3 0 0 3

Course Objectives

- Familiarize students with technology and programming platform for developing software systems
- Enable students to design databases and carry out coding design for the development of enterprise software systems.
- Enable students to maintain large scale software systems by analyzing existing coding and incorporating change requirements

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Develop software applications using java, javascript libraries and java servlets
2. Design administrator module to control the resource allocation in enterprise software systems
3. Design human resource module for enterprise software systems
4. Design systems to manage financial accounting, material and inventory mananagement
5. Analyze production process for manufacturing and other different types of enterprises

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2				2								2	
2	2	2	3		1								3	
3	2	2		1	1								3	
4	2	2		-	1								3	
5	2	2			1								3	

UNIT I **9 Hours**

PROGRAMMING BASICS

Introduction to Java Enterprise System - Server side programming - Client Side Programming - JavaScripts Libraries - Web Application Life Cycle Events Framework - Web Application Security - Servlet and JSP Filters - Introduction to RESTful web services

UNIT II **9 Hours**

ADMIN MODULE

Defining Roles, Role Management, User Management, User Activity Tracking, Design and implementation

UNIT III **9 Hours**

HR MODULE

Employee Management, Leave Management, Time and Attendance Management, Payroll Management, HR Reporting, Design and Implementation

UNIT IV **9 Hours**

MATERIAL MANAGEMENT AND ACCOUTING MODULE

Introduction to financial accounting, Design of accounting systems, Stores management system design, inventory and stock management

UNIT V **9 Hours**

PRODUCTION MODULE

Defining Production Process for Academics, Curriculum, Time Management, Attendance Management, Performance Management, Design and Implementation

FOR FURTHER READING

Cloud based enterprise systems

Total: 45 Hours

Reference(s)

1. John Brock, Arun Gupta, Geertjan Wielenga , "Java EE and HTML5 Enterprise Application Development", McGraw Hill Education, 2014
2. Dominic Duggan, Enterprise Software Architecture and Design: Entities, Services, and Resources, IEEE Computer Society, 2012
3. Alan W. Brown, Enterprise Software Delivery, Addison Wesley, Jun 2012
4. Baron Schwartz, Peter Zaitsev, and Vadim Tkachenkom, "High Performance Mysql", by O'Reilly Media, 2012

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	2				6					6			6											24
2		2						6			6					6									20
3	2	2				4	4				8											6			26
4		5									5				5										15
5			5				5			5															15
Total																									100

Assessment Questions

Remember

1. List the benefits of using openID based authentication for enterprise software systems.
2. State the usage of http-equiv attribute of html meta tag.
3. What are character encodings? Why UTF-8 is preferred as default character encoding?
4. What is a scriptlet in JSP and write its syntax?
5. What are the advantages of using jquery over java scripts in a java server page?

Understand

1. Differentiate between GET method and POST method of HTTP protocol.
2. Differentiate between getParameter, getParameterValues and getParameterNames methods of request object.
3. How to select elements using jQuery with the given element tag-name? Give example coding.
4. How are activities, roles and users related to each other? illustrate with a neat sketch

Apply

1. How are session variables established in java servlets? Illustrate with code snippets.
2. After deploying the system in production environment, any change in database password should not require re-deployment / re-compiling. How to adhere to this requirement?
3. People with different roles will have different startup / welcome page. How is this feature implemented in admin module?

Analyse

1. List the different methods of storing user passwords and compare them with respect to security and privacy.
2. The more flexibility you have, the more errors or bad practices you can made. High flexibility works only with highly intelligent programmers, others will turn the project into unmanagable nightmare. Relate this statment to JSF, JSP/Servlet and Jquery / Javascript.
3. Analyze the pros and cons of adopting the MVC design pattern for your application based on JSP and doing away with JSF.

Evaluate

1. Assume that you need to design a table to store the payroll data of employees and currently you requirement document contains the following heads under the salary: BASIC, DA, HRA, PPF, IT_DEDUCTION. There are two ways to design the table as given below. Solution1: Define a table with BASIC, DA, HRA, PPF, IT_DEDUCTION as its columns Solution2: Define a table with BASIC, DS, HRA, PPF, IT_DEDUCTION as rows (records) and design another table to store the values. Compare these two approaches with respect to change request and code maintenance.

Create

1. Identify the different core entities that are required for desiging a schema for employee attendance managment system and explain the relationship between them with the help of a neat sketch. Also illustrate how your design is adaptable to possible change requests. The design should incorporate shift, regular and other categories of work timings.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT031 UI UX DESIGN AND PROGRAMMING 3 0 0 3

Course Objectives

- Familiarise students with UI design concepts to improve user experience

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Design user interfaces considering requirements and user needs
2. Design Mobile user interfaces by applying material design concepts
3. Develop responsive design framework for real world problems.
4. Build and manage an interactive website or application and apply industry standard practices for user experience design.
5. Design custom framework for Enterprise applications using css and &js.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		1											
2	2		1		-									
3	2		1		2									
4	2		2		-									
5	2		3											

UNIT I **9 Hours**

INTRODUCTION

UI Developer roles and Responsibilities - UX designer roles - Technologies needed - Power of UI - Current market requirements on UI - Sample Webpages - DOM - Structure of HTML Page - Mandatory tags - Applying CSS

UNIT II **9 Hours**

JAVASCRIPT

Java Script - Jquery Framework - Traversing methods - Events - Ajax - Templating, jQuery UI - Interactions, widgets, utilities, Effects

UNIT III **9 Hours**

RESPONSIVE DESIGNS

Making a page to work on multiple devices - Media queries - Introduction to Responsive design Frameworks

UNIT IV **9 Hours**

MATERIAL DESIGN FOR ANDROID DEVELOPERS

Introduction - Principles - Material Theme - Lists and Cards - Shadows and Clipping Views - Animation - Compatibility - Colors with Palette - Design Support Library

UNIT V **9 Hours**

CUSTOM FRAMEWORK DEVELOPMENT

Writing custom css & js, Applying best coding practices, Responsive menus and tables in pure css

FOR FURTHER READING

Emerging frameworks for UI design

Total: 45 Hours

Reference(s)

1. Ian Brooks, The Importance of User Experience: A Complete Guide to Effective UI and UX Strategies for Creating Useful and Usable Mobile & Web Applications, 2014
2. Ryan Cohen, Tao Wang, GUI Design for Android Apps, Apress, 2014

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT032 NETWORKING ESSENTIALS 3 0 0 3

Course Objectives

- Familiarise Students with the practical concepts of enterprise networking
- Familiarise Students with enterprise Switching, Routing and Security

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Select and obtain network services and network application requirements according to enterprise procedures
2. Configure Junos OS and monitor the basic device operations
3. Configure Switches and routers with policies for the design of enterprise network
4. Identify and Troubleshoot problems associated with IP addressing and host configurations.
5. Implement security policies for securing enterprise wide network

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		1											
2	3		1											
3				2	3						1			
4			2				3						1	
5			2				1	3						

UNIT I **6 Hours**

NETWORK FUNDAMENTALS

Network, Ethernet LANs, Routing basics, IP addressing, WAN technologies, Transport Layer Protocols

UNIT II **9 Hours**

JUNOS OVERVIEW

JUNOS Fundamentals, User interface options, Initial configuration, Secondary System Configuration, Operational Monitoring and Maintenance

UNIT III **10 Hours**

ROUTING ESSENTIALS

Routing Fundamentals, Routing Policy, Firewall Filters, Unicast reverse path forwarding, Class of Service (CoS)

UNIT IV **10 Hours**

INTERMEDIATE ROUTING

Protocol independent Routing, Load Balancing and Filter based forwarding, Open shortest path first, BGP, IP tunneling, High Availability

UNIT V **10 Hours**

ENTERPRISE SWITCHING AND SECURITY

Layer 2 switching, Virtual Networks, Spanning tree, Port security, device security and firewall filters, UTM

FOR FURTHER READING

Networking monitoring tools and APIs

Total: 45 Hours

Reference(s)

1. Peter Southwick, Doug marschke and harry reynolds, Junos Enterprise Routing, 2nd Edition, Reilly media publication, 2015

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT033 MACHINE LEARNING 3 0 0 3

Course Objectives

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Course Outcomes (COs)

1. Apply and evaluate classification and regression learning algorithms to given dataset.
2. Apply and Analyze appropriate model to fit parameter values to carryout forecasting calculation with use of statistics.
3. Apply and Analyze directed and undirected graphical models to represent the probability distribution to evaluate the performance of inference and learning.
4. Apply information retrieval techniques to locate relevant information in large collections of data.
5. Analyze practical recommendations about deploying information retrieval systems in different search domains.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3		3	1									
2	2	2		3	1	1								
3	3	2	2			1								
4	1	2		3										
5	1	1	2	3	1									

UNIT I **9 Hours**

LINEAR MODELS

History of Machine Learning-Algorithm Types for Machine Learning-Uses for Machine Learning-Languages for Machine Learning - Linear Regression, Logistic Regression, Maximum likelihood estimation, Robust Linear Regression, Principle Component Analysis, Bayesian Classifier, Support Vector Machines. Solar Power Prediction using Machine learning regression techniques. Using Linear Regression to forecast future trends in Crime

UNIT II **9 Hours**

UNIT II TIME SERIES ANALYTIS

Applications- Single Moving Average - Centered Moving Average - Exponential Smoothing - Single - Double - Triple; Univariate Time Series Models : Stationarity -Seasonality - Box Jenkins Approach ; Multivariage Time Series Models - Machine Learning Strategy for Time Series Forecasting.

UNIT III **9 Hours**

UNIT III GRAPHICAL MODELS

Bayesian networks - Hidden Markov models - Markov Property - Markov Chains, Types of Models Discrete Markov process - Finding the state sequence - Model selection. Building Application Failure Prediction Models - Hidden Markov Model in Information Retrieval

UNIT IV **9 Hours**

UNIT 4 INFORMATION RETRIEVAL

Role of ML in IR- Experimental Evaluation: Performance Metrics: recall- precision - F-measure. Evaluation on benchmark text collections - Document representation - Data Structure and File Organization in IR - Automatic Indexing and Indexing Models, Music Information Retrieval.

UNIT V **9 Hours**

UNIT V SEARCHING AND FILTERING MODELS

Relevance Feedback - User Profiles - Collaborative Filtering - Document and Term Clustering, Document Categorization. Web Search : IR Systems and the WWW - Search engines; spidering; metacrawlers; directed spidering; link analysis (e.g. hubs and authorities, Google Page Rank); shopping agents - Heterogeneous Information Sources - Intelligent Web Agents. Searching and Filtering in Shared data base.

Total: 45 Hours

Reference(s)

1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
2. Christopher M.Bishop,"Pattern Recognition and Machine Learning", Springer, 2006
3. Christopher D. Manning,Prabhakar Raghavan and Hinrich Schutze,"Introduction to Information Retrieval", Cambridge University Press, Cambridge, 2008
4. Ricardo Baeza-Yates and Berthier Ribeiro-Neto,"Modern Information Retrieval", Addison Wesley, New Delhi, 2011
5. http://www.itl.nist.gov/div898/handbook/pmc/section4/pmc4.htm

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions
Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT034 LINUX ADMINISTRATION 3 0 0 3

Course Objectives

- Understand essential tools to access a shell prompt and issue commands with correct syntax
- Operate running systems by identifying CPU/memory intensive processes and kill processes
- Configure systems, web server to mount file systems at boot by Universally Unique ID (UUID)

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Manage user groups using the essential tools and handle files, directories with command-line environments
2. Identify the processes and apply security services in Linux
3. Configure file systems and analyze the scheduling of tasks
4. Configure local storage and create the partitions and logical volumes for given development environment
5. Manage network service, apply web services using Apache and email configuration using postfix for given development environment

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2				1									
2	1				2									
3	1		2											
4	2		2		3									
5	1				2								3	

UNIT I **9 Hours**

VIRTUAL CONSOLE COMMUNICATION

Accessing the Command Line - Managing Files from the Command Line - File-system Tree -Getting Help using Man Terminology - Creating, Viewing and Editing Text Files - Manage Local Linux Users and Groups.

UNIT II **9 Hours**

PROCESS LIFECYCLE AND CONTROLLING SERVICES

System Permissions - process states - Monitoring and Managing Linux Processes - Controlling Services - Configuring and Securing Open - SSH Service - Analyzing and Storing Logs - Backups and Transfer Files Over the Network.

UNIT III **9 Hours**

FILE SYSTEM AND TASK MANAGEMENT

Controlling Access to Files with Linux File - Controlling Access to Files with Access Control Lists(ACL) - Regular Expressions for searching - Creating and Editing Text files with vim - Linux tasks scheduling - Managing Priority of Linux Processes.

UNIT IV **9 Hours**

STORAGE MANAGEMENT

Adding Disks, Partitions, and File Systems to a Linux System - Logical Volume Management(LVM) Storage - Network Attached Storage with Network File System (NFS) - Network Storage with Samba (SMB) - Controlling and Troubleshooting Linux boot Process.

UNIT V **9 Hours**

NETWORK ADMINISTRATION

Configure IPV6 Networking - Network Port Security - Managing DNS for Servers - Configuringthe Firewall - SELinux Security - Configuring Email Transmission - Remote Block Storage and File Storage - configuring Apache HTTPD Web Service.

Total: 45 Hours

Reference(s)

1. Michael Turner, Steve Shah, Ã¢??Red Hat Linux Administration: A Beginner's GuideÃ¢??, McGraw-Hill Osborne Media, Sixth Edition, 2012.
2. Sander van Vugt, Ã¢??Red Hat Enterprise Linux 6 Administration: Real World Skills for Red Hat AdministratorsÃ¢??, John Wiley & Sons, 23-Jan-2013.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT035 STREAMING ANALYTICS 3 0 0 3

Course Objectives

Programme Outcomes (POs)

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Course Outcomes (COs)

1. Classify static and stream data and analyse the issues in stream proecssing
2. Analyse the streaming data by using advanced tools like apache zookeeper
3. Illustrate the data flow in distributed environment and analyse how the message passing takes place in it.
4. Interpret the streaming data processing and detection of duplicate data by using advanced data analytic tools
5. Analyse the Visualizing Data and by using data analytics

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1				2	3			2						
2			3	1	3									
3			2	3				3						
4			2	3	1									
5			2	3	3									

UNIT I **9 Hours**

INTRODUCTION TO STREAM COMPUTING

Streaming Data - Sources - Difference between Streaming Data and Static Data. Overview of Large Scale Stream Processing Engines - Issues in Stream Processing.

UNIT II **9 Hours**

STREAMING ANALYTICS ARCHITECTURE

Phases in Streaming Analytics Architecture - Vital Attributes - High violability - Low Latency - Horizontal Scalability-Fault Tolerance - Service Configuration and Management - Apache Zookeeper.

UNIT III **9 Hours**

DATA FLOW MANAGEMENT

Distributed Data Flows - At Least One Delivery - Apache Kafka - Apache Flume - Zero MQ - Messages, Events, Tasks & File Passing.

UNIT IV **9 Hours**

PROCESSING AND STORING STREAMING DATA

Distributed Stream Data Processing: Co-ordination, Partition and Merges, Transactions. Duplication Detection using Bloom Filters - Apache Spark Streaming Examples Choosing a storage system - NoSQL Storage Systems.

UNIT V **9 Hours**

DELIVERING STREAM ANALYTICS

Visualizing Data - Mobile Streaming Apps - Times Counting and Summation - Stochastic Optimization - Delivering Time Series Data.

UNIT VI **3 Hours**

FOR FURTHER READING

Streaming analytics for open source systems, event stream processing

Total: 48 Hours

Reference(s)

1. Byron Ellis, Real-Time Analytics: Techniques to Analyze and Visualize Streaming Data, Wiley, 1st edition, 2014.
2. Sherif Sakr, Large Scale and Big Data: Processing and Management, CRC Press, 2014
3. Bill Franks, Taming The Big Data Tidal Wave Finding Opportunities In Huge Data Streams With Advanced Analytics, Wiley, 2012
4. Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman, Ã*ƒ*Â¢??Mining of Massive Datasets, Cambridge University Press, 2014
5. Paul C Zikopoulos, Chris Eaton, Paul Zikopoulos, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming DataÃ*ƒ*Â¢??, McGraw-Hill, 1st edition, 2011

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
6																									0
Total																									0

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT036 HIGH PERFORMANCE COMPUTING 3 0 0 3

Course Objectives

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Analyse Linux commands to perform operations in the Linux operating system.
2. Apply High Performance Computing in order to solve large problems in science, engineering, or business.
3. Build job scheduler to optimize workload management in High performance computing environments.
4. Analyse how commands are used to store data in PBS queue to request additional resources.
5. Inference parallelization to process data in parallel in order to execute faster

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	2										3	2
2	3	2	2										2	2
3	1	2	3										2	1
4		2	2										2	1
5	1	2	2										2	1

UNIT I **9 Hours**

LINUX BASIC CONCEPTS

Introduction to Linux Operating System - Linux File System - Linux Installation on VM(s) -Software Configuration - Linux Commands - Shell Scripts.

UNIT II **9 Hours**

HIGH PERFORMANCE COMPUTING (HPC)

Evolution of HPC - HPC Applications - Architecture - File System - Management Network - Infiniband Network - Creation of NFS Server - Mount File System on NFS Client - NIS Server - NIS Client - Installation and Configuration - User Creation.

UNIT III **9 Hours**

JOB SCHEDULER

PBS Pro - Architecture - Features - Terminology - PBS Pro Master Node - Execute Node - Client Node - Installation and Configuration

UNIT IV **9 Hours**

JOB SUBMISSION AND CONTROL

Job Submission and Monitoring: Interactive Job Submission - Serial Job Submission - Parallel Job Submission - Array Job Submission - Job Control: Delete Job - Hold/Release Job - Suspend/Resume Job.

UNIT V **9 Hours**

PARALLELIZATION

Profiling and Optimization of Sequential Applications -Shared and Distributed Memory Architecture - Introduction to Vectorization - Parallelization - OpenMPI and MPI - Performance Analysis - Parallelization of Matrix Multiplication.

Total: 45 Hours

Reference(s)

1. . Blum R, Ã¢??Linux Command Line and Shell Scripting BibleÃ¢??, Second Edition, Wiley India, 2011
2. . Wilkinson Barry and Michael Allen, Ã¢??Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel ComputersÃ¢??, Second Edition, Prentice Hall Inc, 2007
3. Michael J. Quinn, Ã¢??Parallel Programming in C with MPI and OpenMPÃ¢??, McGraw Hill, 2004.
4. Grama, A. Gupta, G. Karypis and V. Kumar, Ã¢??Introduction to Parallel ComputingÃ¢??, Second Edition, Addison, 2003.
5. Wilkinson and M. Allen, Ã¢??Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel ComputersÃ¢??, 2/e, Prentice Hall, 2005.
6. G.E. Karniadakis, R.M. Kirby II, Ã¢??Parallel Scientific Computing in C++ and MPI: A Seamless Approach to Parallel Algorithms and their ImplementationÃ¢??, Cambridge University Press, 2003.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions
Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT037 SOCIAL NETWORK ANALYTICS 3 0 0 3

Course Objectives

- Understand the Strategic aspects with real time in Social Media analytics
- Formalize different types of entities and relationships and represent the information as relational data
- Conduct basic social network analysis to include centrality, subgroup analysis, social theory, and statistical analysis of networks

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs)

1. Apply best practices in web and social media analysis that can be used to process data in information technology and social science domains
2. Develop skills to use online forums for communication
3. Apply knowledge for current web development in the era of Social Web
4. Examine the tools and an algorithm for mining in social networks
5. Use appropriate information visualization technique to gain insights into large Data sets

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2			2										
2					3	2								
3	2				1	2								
4				3		2								
5		1				3			-	2				

UNIT I **9 Hours**

INTRODUCTION

Overview: Social network data-Formal methods- Paths and Connectivity-Graphs to represent social relations-Working with network data- Network Datasets -Strong and weak ties - Closure, Structural Holes, and Social Capital

UNIT II **9 Hours**

SOCIAL INFLUENCE

Homophily: Mechanisms Underlying Homophily, Selection and Social Influence, Affiliation,Tracking Link Formation in OnLine Data, Spatial Model of Segregation - Positive and Negative Relationships - Structural Balance - Applications of Structural Balance, Weaker Form of Structural Balance

UNIT III **9 Hours**

INFORMATION NETWORKS AND THE WORLD WIDE WEB

Structure of Web - World Wide Web- Information Networks, Hypertext, and Associative Memory-Web as a Directed Graph, Bow-Tie Structure of the Web- Link Analysis and Web Search- Searching the Web: Ranking, Link Analysis using Hubs and Authorities- Page Rank- Link Analysis in Modern Web Search, Applications, Spectral Analysis, Random Walks, and Web Search

UNIT IV **9 Hours**

SOCIAL NETWORK MINING

Clustering of Social Network graphs: Betweenness, Girvan newman algorithm-Discovery of communities- Cliques and Bipartite graphs-Graph partitioning methods-Matrices-Eigen values-Simrank

UNIT V **9 Hours**

VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

Graph Theory-Centrality-Clustering -Node-Edge Diagrams,Matrix representation, Visualizing Online Social Networks,Visualizing Social Networks with Matrix-Based Representations-Matrix Node- Link Diagrams, Hybrid Representations -Applications -Covert Networks -Community Welfare -Collaboration Networks -Co-Citation Networks

Total: 45 Hours

Reference(s)

1. Easley, Kleinberg, "Networks, Crowds and Markets: Reasoning about a highly connected world",3rd Edition,Cambridge Univ Press, 2010
2. Jure Leskovec, Anand Rajaraman, Milliway Labs, Jeffrey D. Ullman, "Mining of Massive Datasets",2nd Edition,Cambridge University Press,2014
3. Borgatti,Everett MG, Johnson J, "Analyzing social networks",1st Edition, SAGE Publications Ltd, 2013
4. John Scott,"Social Network Analysis: A Handbook",3rd Edition, SAGE Publications Ltd,2013
5. Robert A Hanneman, Mark Riddle, "Introduction to social network methods", University of California, 2008

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT039 STORAGE MANAGEMENT ESSENTIALS 3 0 0 3

Course Objectives

- Familiarize students with the deployment and management of various data storage systems including hadoop storage, openstack swift, cinder and ceph.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Understand the fundamentals of file systems, DAS, NAS and SAN
2. Use hadoop environment for data processing
3. Install and configure swift and cinder for data storage requirements
4. Deploy ceph storage system and configure block and object storage solutions.
5. Install, configure and use document oriented data management solutions for data storage needs.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1		1							2			1
2	1	1		2		1	-				1			1
3	2	2	-	1		1	-				-		1	2
4	1	2	2	-	1						2			2
5	1	3	-	2	-	1					2		1	2

UNIT I **9 Hours**

STORAGE FUNDAMENTALS

Introduction - File Systems -Storage components - Direct Attached Storage - Network Attached Storage - Storage Area Network - Storage management

UNIT II **9 Hours**

HADOOP STORAGE

Hadoop overview - HDFS Architecture: Name Nodes, Data Nodes, File System Namespace, Data Replication, Persistency, Communication Protocols, Data Organization and accessibility, space Reclamation - SAN for Hadoop Storage - Replication - DFS for Hadoop - Hadoop on cloud object storage

UNIT III **9 Hours**

OPENSTACK STORAGE

Object storage overview - Swift architecture - Components of object storage - Rings - Installation and Configuration - object storage deployment - Block storage - Architecture - Components of Block Storage - Block Storage Deployment - Attaching Blocks to VM instances - java api integration

UNIT IV **9 Hours**

CEPH STORAGE

Introduction - ceph architecture: Ceph storage cluster, Scalability and HA, Dynamic Cluster Management, Erasure Coding, Cache Tiering - configuring ceph - ceph filesystem - ceph protocol - ceph clients - Ceph Manager Daemon, Ceph Object Gateway

UNIT V **9 Hours**

CASE STUDY

MongoDB - Data Model, Query Model, Data Consistency, Data Management, Big data storage options for hadoop - cloud object storage - SNIA Certification

FOR FURTHER READING

Google Storage Architecture, Amazon Storage services

Total: 45 Hours

Reference(s)

1. Greg Schulz, Cloud and Virtual Data Storage Networking, CRC Press, Taylor & Francis Group, 2012
2. Amar Kapadia, Sreedhar Varma, Kris Rajana, Implementing Cloud Storage with OpenStack Swift.PACKT Publishing, 2014
3. Nigel poulton, Data Storage Networking: Real World Skills for the CompTIA Storage+ Certification and Beyond, SyBEX (A wiley brand),2014
4. Greg Schulz, Software Defined Data Infrastructure Essentials, CRC press, 2017
5. Dirk deRoos, poul C. zikopoulos, Roman B Melnyk, Bruce Brown, Hadoop for Dummies, A wiley Brand, 2017
6. Hubbert Smith, Storage Foundations: And Comptia Storage+ Powered By Snia Study Guide, SNIA, 2015

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT040 ENTERPRISE DATA MANAGEMENT 3 0 0 3

Course Objectives

- Introduce students the fundamentals of enterprise data management system, system deployment, data model design concepts and data auditing techniques

Programme Outcomes (POs)

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. Deploy and maintain data management systems for enterprises
2. Analyze enterprise requirements and design efficient data models for system implementation
3. Understand enterprise reporting, enterprise messaging and notification system needs
4. Understand the importance of data security and data auditing techniques
5. Manage enterprise unstructured data

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			3											
2		2	3											
3		2		3										
4		2												
5			2											

UNIT I **9 Hours**

SYSTEM DEPLOYMENT

Installing DBMS, Securing access, storage internals, storage engine (innodb), understanding system files and daemons, system databases, configuration parameters, global variables, management tools, clustering

UNIT II **9 Hours**

ENTERPRISE DATA MODELLING

Fundamental principles, Design of scalable data models, data warehousing principles, row vs column modelling, facts and derived data modelling, key-value pair modelling, optimal usage of joins, high performance dynamic queries, System design case studies.

UNIT III **9 Hours**

ENTERPRISE REPORTING

Reporting fundamentals and tools, Reports design, RESTFul APIs and external data integration, Best practices, Design of analytics integrated reports, custom query generators, enterprise messaging and notification reports, case studies.

UNIT IV **9 Hours**

ENTERPRISE DATA SECURITY AND BACKUP

Data audit management, Message Digest Techniques, Enterprise data audit process, Backup Management, Full backup, Incremental Backup, Enterprise-wide policies

UNIT V **9 Hours**

ENTERPRISE DOCUMENT MANAGEMENT

Introduction to object storage architecture, installation and configuration, no sql queries, case studies: usage of non relational and object databases, Cloud document storage services, Integrating cloud document storage with enterprise applications

FOR FURTHER READING

Database clustering, Design of high performance information retrieval systems

Total: 45 Hours

Reference(s)

1. Saumya Chaki, Enterprise Information Management in Practice: Managing Data and Leveraging Profits in Today's Complex Business Environment, 2015
2. David Wood, Linking Enterprise Data, Springer, 2014
3. Vivek kale, Creating Smart Enterprises: Leveraging Cloud, Big Data, Web, Social Media, Mobile and Iot Technologies, CRC Press, 2017
4. Kristina Chodorow, MongoDB: The Definitive Guide Paperback, O'Reilly 2014

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT041 ENTERPRISE SYSTEMS SECURITY AND FORENSICS

3 0 0 3

Course Objectives

- Enable students to secure enterprise eco systems components including network, web server, application server, database server and devices.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Course Outcomes (COs)

1. Manage enterprise networking and enterprise firewall to protect enterprise resources
2. Identify the client side and server side vulnerabilities of enterprise software and protect them from exploits
3. Deploy enterprise application and database servers and secure them
4. Understand role based access systems and protect enterprise data from unauthorized modifications
5. Manage enterprise devices, apply policies and carry out forensics

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2				1									
2	3		2		1			1						
3	2		2		1									
4		2	1	-	2									
5			1		2									

UNIT I **9 Hours**

ENTERPRISE NETWORK SECURITY

Enterprise Networking - Firewall Management, System Deployment Architecture, VLAN and Network Isolation, port blocking, safe guarding DNS, DNS attack tactics and case studies, Distributed Denial of Service mitigation, Network Forensics, Open-source security tools for network forensic analysis

UNIT II **9 Hours**

ENTERPRISE APPLICATION SECURITY

Enterprise Application Architecture, Common threats, Browser exploits, Client side security, server side security, sql attacks, script injection attacks, web application firewalls, Application Level Forensics

UNIT III **9 Hours**

ENTERPRISE SERVER SECURITY

Server Deployment, Securing Server access, Securing Communication with Web Servers: SSL configuration, web server vulnerabilities, Penetration Testing Forensics analysis of web servers, Securing Application Servers, Securing Database Servers, Database Forensics

UNIT IV **9 Hours**

ENTERPRISE DATA SECURITY

Privacy and Protection, Data Security Policies, user rights management, Data Hashing, Role based access, Detecting unauthorized data modifications, Data access forensics

UNIT V **9 Hours**

DEVICE SECURITY

Common device threats, Mobile devices security, securing windows systems, Managing users and their rights, computer system forensics, mobile device forensics, opensource tools, Legal Aspects of Digital Forensics, IT Act 2000, amendment of IT Act 2008, Cyber Crime Scene Analysis, Evidence Management & Presentation

FOR FURTHER READING

Recent trends in mobile forensic technique and methods to search and seizure electronic evidence.

Total: 45 Hours

Reference(s)

1. Manish Gupta and Raj Sharman, Information Technology Risk Management and Compliance in Modern Organizations, 2017
2. Greg Witte, Melanie Cook, Matt Kerr, Shane Shaffer, Security Automation Essentials: Streamlined Enterprise Security Management & Monitoring, 2012
3. Adrian Pruteanu and Zeal Vora, Enterprise Cloud Security and Governance: Efficiently set data protection and privacy principles, 2017

15IT0YA DATABASE MANAGEMENT SYSTEMS 3 0 0 3

Course Objectives

- Understand the concepts of database
- Design a good Relational Database using SQL
- Create and manipulate database tables using basic and advanced SQL Queries

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Design a table from ER diagram and normalize to reduce the redundancy.
2. Construct a table and provide privileges to perform operations on the table.
3. Develop a query to retrieve data from more than one table and display the required data.
4. Apply SQL queries on Stored Procedures, Functions and Triggers in Relational Database.
5. Identify the Roles and Responsibilities of Database Administrator.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		3		2								1	1
2	1		2	2	3								1	2
3	1		2	2	3								1	2
4	1		3	3									1	2
5	1		3	1									1	1

UNIT I **8 Hours**

DATABASE DESIGN CONCEPTS

Fundamentals of Database - Features of Good Relational Design - Normalization - 1NF -2NF-3NF-BCNF-ER Diagrams- Keys - ACID

UNIT II **8 Hours**

BASIC QUERIES

DML (Data Manipulation Language) - Insert -Update -Delete - Merge - Select- DDL(Data Definition Language) - Create - Alter -Drop - Truncate - Comment - Rename- DCL (Data Control Language)- Grant - Revoke - TCL(Transaction Control Language)-Commit - Savepoint - Rollback

UNIT III **10 Hours**

ADVANCED QUERIES I

Select - Where - Distinct - Like- Order By - Group By - Having - Joins - Left Outer - Right Outer - Full Outer - Inner Join - Natural Joins - Cartesian Product - Subquery

UNIT IV **10 Hours**

ADVANCED QUERIES II

Case - When - In - Any - All - And - Or - Not - Null - Ifnull- Pl/Sql - Functions- Stored Procedures - Triggers - Cursors

UNIT V **9 Hours**

DATABASE ADMINISTRATION

Database Users - Dba - Roles - Installation - User Creation - Privileges - Data Backup - Mirroring - Data Recovery - Tuning

FOR FURTHER READING

Fourth Normal form - Fifth Normal form - No SQL - New SQL - JDBC - ODBC - Database Types - Serializability - Taxonomy of concurrency control mechanisms - Locking and algorithms - Optimistic concurrency control algorithms

Total: 45 Hours

Reference(s)

1. Silberchatz, Korth, Sudarsan, "Database System and Concept", sixth edition, Mcgraw, 2013
2. Dr. P.S. Deshpande, "SQL & PL/SQL for oracle 10G Black book", Second edition, Wiley, 2010
3. Santhosh Kumar K, "JDBC, Servlets, and JSP Black book",Third Edition, Wiley, 2008

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4					8				6															18
2	2					2	4					4			8										20
3	4										8								12						24
4	2						4			6															12
5	3					4								8	4			4	3						26
Total																									100

Assessment Questions

Remember

1. Define Database.
2. What is normalization?
3. Explaon 1NF, 2NF and 3NF in detail.
4. Compare 1NF and 2NF
5. List out the symbolsin ER diagram.
6. Differentiate Drop and Truncate keyword in SQL
7. What is the full form of **SQL**?

A. Structured Query Language
B. Structured Query List
C. Simple Query Language
D. None of these

7. List out the four database users.

Understand

1. Why we need Normalization?
2. How to design a good relational database?
3. Specify the uses of ACID property in RDBMS.
4. Triggers are written to be executed in response to any of the following events −
   A - A database manipulation (DML) statement (DELETE, INSERT, or UPDATE).
   B - A database definition (DDL) statement (CREATE, ALTER, or DROP).
   C - A database operation (SERVERERROR, LOGON, LOGOFF, STARTUP, or SHUTDOWN).
   D - All of the above.
5. In SQL, which command(s) is(are) used to change a table's storage characteristics?
   A. ALTER TABLE
   B. MODIFY TABLE
   C. CHANGE TABLE
   D. All of the above
6. In SQL, which command(s) is(are) used to change a table's storage characteristics?
   A. ALTER TABLE
   B. MODIFY TABLE
   C. CHANGE TABLE
   D. All of the above
7. Mention the uses of subquery.
8. Explain about data recovery process.
9. Compare funcyions and stored procedure.
10. SQL injection is an attack in which _____ code is inserted into strings that are later passed to an instance of SQL Server.
    a) malicious
    b) redundant
    c) clean
    d) non malicious

Apply

1. Discuss about DML, DDL, DCL commands in sql with an example.
2. Find the name of cities with all entries whose temperature is in the range of 71 and 89
   A. SELECT * FROM weather WHERE temperature NOT IN (71 to 89);
   B. SELECT * FROM weather WHERE temperature NOT IN (71 and 89);
   C. SELECT * FROM weather WHERE temperature NOT BETWEEN 71 to 89;
   D. SELECT * FROM weather WHERE temperature BETWEEN 71 AND 89;
3. Find the name of cities with all entries whose temperature is in the range of 71 and 89
   A. SELECT * FROM weather WHERE temperature NOT IN (71 to 89);
   B. SELECT * FROM weather WHERE temperature NOT IN (71 and 89);
   C. SELECT * FROM weather WHERE temperature NOT BETWEEN 71 to 89;
   D. SELECT * FROM weather WHERE temperature BETWEEN 71 AND 89;
4. Find the name of cities with all entries whose temperature is in the range of 71 and 89
   A. SELECT * FROM weather WHERE temperature NOT IN (71 to 89);
   B. SELECT * FROM weather WHERE temperature NOT IN (71 and 89);
   C. SELECT * FROM weather WHERE temperature NOT BETWEEN 71 to 89;
   D. SELECT * FROM weather WHERE temperature BETWEEN 71 AND 89;
5. Find the name of cities with all entries whose temperature is in the range of 71 and 89
   A. SELECT * FROM weather WHERE temperature NOT IN (71 to 89);
   B. SELECT * FROM weather WHERE temperature NOT IN (71 and 89);

C. SELECT * FROM weather WHERE temperature NOT BETWEEN 71 to 89;
D. SELECT * FROM weather WHERE temperature BETWEEN 71 AND 89;

6. GRANT SELECT ON Table_1 to role_A WITH GRANT OPTION;
   A) Above statement gives an optional GRANT to role_A.
   B) Above statement gives role_A the right to GRANT the same permission to others.
   C) With "WITH GRANT OPTION" in above statement user is allowed GRANT on whole database.
   D) None of above.
7. If you want to grant demo_role the permission to create stored procedure then which of the below query can be used?
   A) GRANT demo_role CREATE PROCEDURE
   B) GRANT CREATE PROCEDURE TO demo_role CASCADE
   C) GRANT CREATE PROCEDURE TO demo_role
   D) GRANT CREATE PROC TO demo_role
8. If INSERT permission is granted on all tables at the database scope, and INSERT is denied on a specific table in the database (schema scope)
   A) INSERT is then denied on that specific table including all sub tables.
   B) INSERT is then denied on all primary tables.
   C) INSERT is then denied on all sys tables.
   D) INSERT is then denied on that specific table.
9. Which of the stored prcoedure is used to test SQL injection attack ?
   a) xp_write
   b) xp_regwrite
   c) xp_reg
   d) All of the mentioned
10. Explicate the different types of JOINS in SQL with an example.

Analyse

1. Mention the uses of BCNF.
2. Which of the following is true about the execution section of a PL/SQL block?
   A - It is enclosed between the keywords BEGIN and END.
   B - It is a mandatory section.
   C - It consists of the executable PL/SQL statements.
   D - All of the above.
3. Consider the following code snippet: how many times the loop will run?

```
DECLARE
  a number(2);
BEGIN
FOR a in 10 .. 20 LOOP
   END LOOP;
END;
```

   A - 11
   B - 10
   C - 9
   D - Infinite loop.
4. Which is the subset of SQL commands used to manipulate Oracle Database structures, including tables?
   A. Data Definition Language(DDL)
   B. Data Manipulation Language(DML)
   C. Both of above
   D. None
5. Can you sort a column using a column alias?
6. Mention any four roles of DBA.
7. How to do Mirroring in SQL.
8. Compare SQL and No-SQL

9. How to set Privileges for database users?
10. If suppose a table has SELECT permission denied on it and then the SELECT permission is granted on that table, the DENY permission is then removed on that table.
    A) True
    B) False
11. Point out the correct statement :
    a) Parameterized data cannot be manipulated by a skilled and determined attacker
    b) Procedure that constructs SQL statements should be reviewed for injection vulnerabilities
    c) The primary form of SQL injection consists of indirect insertion of code
    d) None of the mentioned
12. When should use the keyword 'WHEN' in SQL.

Evaluate

1. Is a NULL value same as zero or a blank space? If not then what is the difference?Is a NULL value same as zero or a blank space? If not then what is the difference?
2. Any user-controlled parameter that gets processed by the application includes vulnerabilities like :
    a) Host-related information
    b) Browser-related information
    c) Application parameters included as part of the body of a POST request
    d) All of the mentioned
3. _____ is time based SQL injection attack.
    a) Quick detection
    b) Initial Exploitation
    c) Blind SQL Injection
    d) Inline Comments
4. Which of the following script is a example of Quick detection in SQL injection attack ?
    a) SELECT loginame FROM master..sysprocesses WHERE spid = @@SPID
    b) For integer inputs : convert(int,@@version)
    c) IF condition true-part ELSE false-part (S)
    d) SELECT header, txt FROM news UNION ALL SELECT name, pass FROM members
5. Which of the following script is a example of Quick detection in SQL injection attack ?
    a) SELECT loginame FROM master..sysprocesses WHERE spid = @@SPID
    b) For integer inputs : convert(int,@@version)
    c) IF condition true-part ELSE false-part (S)
    d) SELECT header, txt FROM news UNION ALL SELECT name, pass FROM members

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT0YB DATA STRUCTURES AND ALGORITHMS 3 0 0 3

Course Objectives

- Understand the abstract data types of stacks and queues
- Understand the variety of ways that linearly and weakly ordered data can be stored, accessed, and manipulated;
- Understand various sorting algorithms and the run-time analysis required to determine their efficiencies

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Apply linear data structures for solving real world computational problems
2. Design an algorithm for the implementation of binary tree and analyze its performance
3. Build a balanced search tree and apply indexing to search the data
4. Design an algorithm for finding the shortest path using graphs.
5. Apply algorithm design techniques for solving real time problems and analyze their efficiency.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3										1	2
2	1	2	2										2	2
3	1	2	2										2	2
4		1	3	1									2	2
5	1	2	3										2	2

UNIT I **9 Hours**

LINEAR STRUCTURES

Abstract Data Types (ADT) - List ADT - array-based implementation - linked list implementation - cursor-based linked lists - doubly-linked lists - applications of lists - Stack ADT - Queue ADT - circular queue implementation - Applications of stacks and queues

UNIT II **9 Hours**

TREE STRUCTURES

Need for non-linear structures - Tree ADT - tree traversals - Binary Tree ADT - expression trees - applications of trees - binary search tree ADT

UNIT III **9 Hours**

BALANCED SEARCH TREES AND INDEXING

AVL trees - Binary Heaps - B-Tree - Hashing - Separate chaining - open addressing - Linear probing

UNIT IV **9 Hours**

GRAPHS

Definitions - Topological sort - breadth-first traversal - shortest-path algorithms - minimum spanning tree - Prim's and Kruskal's algorithms - Depth-first traversal - applications of graphs

UNIT V **9 Hours**

ALGORITHM DESIGN AND ANALYSIS

Greedy algorithms - Divide and conquer - Dynamic programming - backtracking - branch and bound - Randomized algorithms - algorithm analysis - asymptotic notations - recurrences - NP complete problems

FOR FURTHER READING

Binary heap - heap sort - knapsack problem - travelling salesman problem

Total: 45 Hours

Reference(s)

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C,Second Edition, Pearson Education, 2015
2. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, Introduction to Algorithms, Second Edition, MIT Press, 2014
3. R F Gilberg, B A Forouzan, Data Structures, Second Edition, Thomson India Edition, 2005.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	4			4	4																			16
2	2				2	4				6					2			2							18
3	2				2					6				2	3							6			21
4		2			2					6				2	3			2				6			23
5		2				2				6				6								6			22
Total																									100

Assessment Questions

Remember

1. What is a data structure?
2. What is a non-linear data structure?
3. What is a linear data structure?
4. List the areas in which data structures are applied extensively.
5. Define stack
6. What is big O notation?
7. What is an ADT?
8. Specify the basic operations of stack and queue.
9. List the applications of stack and queue.

10. What is tree and List out few of the applications of tree data-structure?

Understand

1. Why recursive algorithms are efficient than non-recursive algorithms?
2. What is the minimum number of queues needed to implement the priority queue?
3. Describe a situation where storing items in an array is clearly better than storing items on a linked list.
4. Write a class definition that could be used to define a node in a doubly linked list. Include only the instance variables, not the methods. Also write one sentence to describe a situation when a doubly linked list is appropriate.
5. How many different trees are possible with 10 nodes?
6. How many different trees are possible with 10 nodes?
7. What is the condition for balancing an AVL tree?
8. What is the suitable data structure for constructing a tree?
9. What are the steps to insert a new item at the head of a linked list?
10. Classify the Hashing Functions based on the methods by which the key value is found.
11. Describe the time complexity of sorting and searching algorithms.

Apply

1. Convert the expression (a+b)*c/d-e into infix, prefix and postfix notations.
2. Demonstrate Djikstra‘s algorithm to find the shortest distance in a weighted graph.
3. Sort the given values using Quick Sort : 65 70 75 80 85 60 55 50 45
4. Construct a tree for the given inorder and postorder traversals.
   Inorder : GBDAHEICF
   Postorder : GDBHIEFCA
5. Identify the meaning of height balanced tree. How rebalancing is done in height balanced tree? Discuss it with suitable example.
6. Define an AVL tree. Obtain an AVL tree by inserting one integer at a time in the following sequence. 150, 155, 160, 115, 110, 140, 120, 145, 130, 147, 170, 180. Show all the steps.
7. Draw a hash table with chaining and a size of 9. Use the hash function "k%9" to insert the keys 5, 29, 20, 0, and 18 into your table.
8. Given a list of elements 12, 45, 56, 89, 78, 125,01, 3, 47, 555, 999, 99, 21 trace the steps to sort them using bubble sort algorithm.
9. Sort the following numbers using radix sort: 523, 244, 7, 80, 930, 920. Show the contents of the queues at the end of the second pass.
10. The preorder traversal sequence of a binary search tree is 30, 20, 10, 15, 25, 23, 39, 35, 42. Find the postorder traversal sequence of the same tree?

Analyse

1. Differentiate linear and non linear data structure.
2. Contrast ADT implementation of array and linked list.
3. Compare internal and external sorting.
4. Differentiate between binary tree and binary search tree.
5. Compare linear and binary search.
6. Distinguish DFS and BFS.

Evaluate

1. Evaluate the best case and worst case complexity for searching algorithms.
2. Can stack be used to perform queue operations? Justify.
3. Explain the Basic operations performed in a Binary heap. Construct a Min and MAX heap for the following values.23,67,1,45,7,89,56,35
4. Summarize the concept of Huffman algorithm for constructing an optimal prefix code.Â Apply the algorithm and find the code for the following data: (a, 300), (b, 384), (c, 77), (d, 34), (e, 23).Â Read the input as (character, frequency).

Create

1. Develop an application using a stack /Queue /List /Tree that reflects a real world problem.
2. Develop an algorithm for Minimax tic-tac-toe algorithm with alpha-beta pruning using backtracking strategy.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT0YC DATA SCIENCES AND ANALYTICS 3 0 0 3

Course Objectives

- Familiarize with the fundamentals of data science and related concepts
- Understand the usage of mathematical models and visualization tools

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Implement data science fundamentals and apply them to day-to-day business and industrial needs
2. Apply probability and statistics methods for data analysis process.
3. Apply clustering and classification algorithms in the data analysis process.
4. Design the mathematical models for data analysis and also perform text mining process
5. Construct the visualization models using d3 and R tools

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		1											
2	2													2
3	1		2											3
4	1			1										3
5	2		1	3										

UNIT I **7 Hours**

INTRODUCTION

Data Science Fundamentals, Exploring data engineering pipelines, Applying data science and data warehousing to business and industry

UNIT II **9 Hours**

PROBABILITY AND STATISTICS

Fundamental concepts of probability, Linear Regressions, simulations, Time series analysis, Association Analysis

UNIT III **11 Hours**

CLUSTERING AND CLASSIFICATION

Basics, Identifying clusters, Nearest Neighbor Algorithms, Classification Algorithms

UNIT IV **9 Hours**

MATHEMATICAL MODELLING

Multicriteria decision making, Numerical Methods in Data Science, Web and spatial data analytics, Text Mining

UNIT V **9 Hours**

VISUALIZATION AND TOOLS

Types of visualizations, using d3.js for data visualization, R Introduction, coding in R, working with Graphics in R, Introduction to Big Data

Total: 45 Hours

Reference(s)

1. Lillian Pierson, Data Science for Dummies, John Wiley,2015
2. Andrie de Vries, Joris Meys, R For Dummies, John Wiley and Sons, 2012

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	2			2	4																			10
2		8				4				8				4											24
3		8				4	8			10				6											36
4	4				4						4														12
5			6								12														18
Total																									100

Assessment Questions

Remember

1. List the different areas that seems to connect with data science field.
2. Differentiate between data warehousing and databases.
3. Differentiate between parametric and non parametric models.
4. List the different types of visualizations that is typically used in the analysis of data.
5. List of benefits of using d3.js java script library.
6. State the working principle of apriori frequent itemset mining algorithm.
7. List the different dimensional modelling techniques applied in data warehousing.
8. What is the purpose of using olap (online analytical processing) software?
9. List the mathematical concepts used in latent semantic indexing.
10. State k-means algorithm for data clustering.

Understand

1. Differentiate between supervised learning and unsupervised learning.
2. How is data science different from other areas such as mathematics and statistics?
3. How do the concepts of probability theory applied in the field of data science? Illustrate with examples.
4. Explain how neural network concepts are applied in data classification problems. Illustrate with examples.
5. How are eigen vectors applied in page raking algorithm?
6. Any supserset of an infrequent itemset is infrequent. Justify.
7. Why do we normalize the rows of adjacency matrix by dividing every element of the matrix by its row count in Page Ranking Algorithm?
8. When does rank sink problem occur in web graphs? Illustrate with an example.
9. Why sigmoid function is preferred as an activation function in backpropagation neural networks?

Apply

1. State and prove bayes theorem.
2. Find the least square regression line for the given data points:{ (-2,-1),(1,1),(3,2) }
3. How to perform a logistic regression in R environment?
4. What are dichotomous outcome variables? Â How is a logit model used in modelling such variables? Â Illustrate with examples.
5. Define a histogram. How do you create a histogram in R programming environment?
6. Write an R program to write a matix to a file.
7. Compute the page rank of following web graph matrix: (1,2), (1,3), (3,2), (3,4), (3,5), (4,5), (5,4). Read the edge data as (vertex1, vertex2).
8. Compute the similarity of the following documents using LSI algorithm: 1. Apple computer is the best computer. 2. The best fruit if apple. 3. Fruit is good for health.

Analyse

1. Analyze the HITS algorithm and LSI algorithm with respect to the mathematical model.
2. In BPN networks, the accuracy of classification depends on theÂ number of hidden layers. Illustrate.

Evaluate

1. Why is the damping factor is usually set to 0.85 in page ranking algorithm?
2. Compare the different classification algorithms including neural network algorithms, distance based algorithms and probabilistic algorithms and suggest a suitable method for fradulent credit card transaction classification.
3. List the different distance measures used in data clustering and identify a suitable measure for spatial data clustering.

Create

1. Design an algorithm to analze the user calling behaviour in a mobile network. You may assume that a matix is used in representing the data.
2. Design a new algorithm to compute frequent itemsets that should address all the disadvantages of Apriori algorithm.
3. Design a suitable schema for constructing a data warehouse for storing ATM transaction records of different banks.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT0YD OBJECT ORIENTED PROGRAMMING 3 0 0 3

Course Objectives

- Understand the concepts of Object Oriented Programming
- Gain thorough knowledge in programming with C++
- Know the dynamic activity in Real world application

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Implement I/O operations usingthe object oriented programming approaches conditional and iterative execution, methods, etc
2. Design Object Oriented programming principles using object and class properties
3. Apply the code reusability techniques of Object Oriented programming using C++
4. Analyze the member functions to optimize the overall system performance
5. Apply generic data types for classes andError handlingfunctions using C++

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2											1	
2	1	2	2										-	1
3		2	3										1	
4		2	3										-	2
5		2	3										1	

UNIT I **9 Hours**

INTRODUCTION

Unstructured, Modular and Procedural oriented approach - Need for object oriented programming - Procedural Languages vs. Object oriented approach - Basic concepts of Object oriented programming - C++ Programming Basics: Basic Program Construction - Output Using Cout - Input with Cin - Data types-Variables and Constants - Operators -Control Statements-Manipulators

UNIT II **9 Hours**

OBJECTS AND CLASSES

Structures and Functions - Simple Class and object - Constructors and Destructors- Object as Function Arguments - Returning Objects from Functions - Array of Objects - Inline functions - Function overloading

UNIT III **10 Hours**

OPERATOR OVERLOADING AND INHERITANCE

Need of operator overloading - Overloading Unary Operators - Overloading binary Operators- Inheritance: Derived Class and Base Class-Derived Class Constructors- Class Hierarchies - Levels of Inheritance

UNIT IV **10 Hours**

POLYMORPHISM AND MEMORY MANAGEMENT

Overriding Member Functions - Virtual Function - Abstract classes and pure virtual function - Friend function - Static Function - Memory Management: new and delete- this Pointer- File streams - Streams - String I/O - Character I/O - File Pointers

UNIT V **7 Hours**

TEMPLATES AND EXCEPTION HANDLING

Templates: Introduction - Function Templates - Overloading Function Templates - Class Templates - Exception Handling - Multiple exceptions, exceptions with arguments

FOR FURTHER READING

Type conversion- Default argument function- Assignment and Copy Initialization- Friend Class - I/O with Multiple Objects-Error handling in file I/O

LAB EXPERIMENTS

1.Program Analysis and Project Planning
2. Software requirement Analysis
3. Data Modeling
4. Software Development and Debugging
5. Software Testing
6. Mini projects - Library Management System, Hotel Management System,Timetable Generation

Total: 45 Hours

Reference(s)

1. Robert Lafore, Object Oriented Programming in-C++, 3rd Edition, Galgotia Publication, New Delhi, 2009
2. Bjarne Stroustrup, The C++ Programming Language, 4th Edition, Addison-Wesley, 2013
3. Deitel and Deitel, C++ How to program, Prentice Hall, New Delhi,2005
4. D. S. Malik , C++ Programming, Thomson,New Delhi, 2007
5. K. R. Venugopal, Rajkumar and T. Ravishankar, Mastering C++, Tata McGrawHill, New Delhi, 2006

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	4	2				4								6											16
2		4			2	2					6							6							20
3			4		2					2	4			4										6	22
4	2	2					4			2	2				6								4		22
5		2				4				6	4											4			20
Total																									100

Assessment Questions

Remember

1. Recall 5 characteristics of procedure-oriented language.
2. List out the features of Object Oriented Programming.
3. Name any four applications of OOPS.
4. Explain the use of this pointer?
5. Define pure virtual functions.
6. List the advantage of default argument in a constructor.
7. Show the class structure of real time environment objects.
8. Outline the functions of Cout and Cin for command line interpretations.
9. Write the specification of an exception. When is it used?
10. Explain, with an example, how you would create space for an array of objects using pointers.

Understand

1. Compare structural and object oriented programming.
2. Explain how will you overload Unary and Binary operator using member functions and friend functions?
3. Classify how the endl and setw manipulator works with an example program.
4. Categorize the features of Procedure Oriented Language and Object Oriented Language.
5. Illustrate the concepts of OOPS with its necessary example for each.
6. Sketch the conversion between objects and basic types in data conversion.
7. Why are destructors used? Write the syntax of destructor.
8. How the concept of overriding is achieved in C++?
9. How is an exception handled while it facing a divided by zero error in C++?
10. When do we use multiple catch handlers?

Apply

1. Construct a program to perform complex number arithmetic operations using operator overloading.
2. Execute a program in C++ to count the number of words in a line of text.
3. Can you transfer values from derived class constructor to base class constructor?
4. Implement a program to create arrays dynamically at run time?
5. What will happen to an object if a destructor is not coded in the program?
6. Make use of all the data types available in C++ programming language in a single program and perform the arithmetic operations on them.
7. Explain with a program about the concept of binary operator overloading for the insertion operator
8. How to achieve operator overloading using friend function?
9. Write a statement that will create an object called fob for writing, and associate it with a file name DATA.
10. A class(or function) template is known as a parameterized class(or function). Comment.

Analyse

1. Â
   Attribute the problems of programming with switch logic. Explain why polymorphism is an effective alternative for using switch logic.

2. Pick out the discrimination's between structured programming language and procedure-oriented language.
3. Locate the features of unconditional branching statements used in C++ with their types.
4. Infer the data members and member functions of a bank account.
5. Data items in a class must always be private. Justify
6. How will you use a single function inside one or more classes?

Evaluate

1. Write a simple program to display the multiplication table of 5 upto 10 times using for loop.
2. Engrave in detail about the recursive functions available in C++ programming and implement the Fibonacci series using recursive functions
3. Define a Divide by Zero definition and use it to throw exceptions on attempts to divide by zero.
4. Identify the error in the following program.

```
#include
Template
T1%26MinMax(T1 t1, T2 t2)
{
return t1>t2 ? t1 : t2;
cout<< ? ?;
}
Void main()
{
Cout<<++MinMax(2,3);
}
```

Create

1. Create a class MAT of size m x n. Define all possible matrix operations for MAT type objects.
2. Generate a class with the overload *= operator such that the operator should also permit the results of the operation to be used in other calculations, as in s3 = s1 *= s2;
3. Construct a program for income tax calculation where the employees are trainee, team lead, manager, senior manager. Illustrate Friend Function for this problem by considering their salary.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT0YE ARTIFICIAL INTELLIGENCE 3 0 0 3

Course Objectives

- Knowledge of what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.
- Artificial Intelligence enables capabilities that are beyond conventional technology, for example, chess-playing computers, self-driving cars, robotic vacuum cleaners.
- Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Analyze a problem and identify, define the computing requirements appropriate to its solution.
2. Identify current techniques, skills, and tools necessary for computing practice.
3. Apply knowledge representation, reasoning, and machine learning techniques to real-world problems
4. Implement classical Artificial Intelligence techniques, such as search algorithms, minimax algorithm, neural networks, tracking, robot localisation.
5. Apply upcoming Artificial Intelligence techniques for problem solving.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2		3									2
2		1			3	2								1
3	2			3					2					1
4			3			3								2
5			3		2					2				1

UNIT I **9 Hours**

INTRODUCTION TO AI

Introduction to AI - Intelligent Agents - Agents and Environments - Behaviour - Structure ofAgents - Problem Solving - Example Problems - approaches - Problem formulation - Problem solving agents - Measuring problem solving performance -Search Strategies

UNIT II **9 Hours**

KNOWLEDGE REPRESENTATION

Relational Knowledge & Procedural Knowledge - Propositional Logic - Inference rules - Inference methods - Knowledge engineering process - Handling uncertain knowledge - Bayesian networks - Learning - Pattern recognition

UNIT III **9 Hours**

KNOWLEDGE BASED SYSTEMS

Expert systems - Components, Characteristic features of expert systems - Rule based system architecture- Using domain knowledge - Expert system shell - Explaining the reasoning and knowledge acquisition - Applications.

UNIT IV **9 Hours**

SEARCHING TECHNIQUES

Informed search strategies greedy best first ÃƒÂ¢?? A* - local search algorithms and optimization-local search in continuous spaces - Constraint satisfaction problems (CSP)- Backtracking search and Local search - Structure - Adversarial Search - Games - Optimal decisions in games - Alpha - Beta Pruning.

UNIT V **9 Hours**

LEARNING

Forms of learning - Supervised learning - Learning decision trees - Artificial neural networks - Support vector machine - Applications - Object Recognition - Robotics.

Total: 45 Hours

Reference(s)

1. Stuart Russell, Peter Norvig, Ã¢??Artificial Intelligence: A Modern ApproachÃ¢??, Prentice Hall, Third Edition, 2014.
2. Nils J. Nilsson, Ã¢??Artificial Intelligence: A new SynthesisÃ¢??, Harcourt Asia Pvt. Ltd., 2000.
3. Elaine Rich and Kevin Knight, Ã¢??Artificial IntelligenceÃ¢??, Second Edition, Tata McGraw Hill, 2003.
4. George F. Luger, Ã¢??Artificial Intelligence-Structures and Strategies for Complex Problem SolvingÃ¢??, Pearson Education, 2002.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT0YF COMPUTATIONAL INTELLIGENCE 3 0 0 3

Course Objectives

- Apply the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control to machine intelligence applications of fuzzy logic.
- Compare the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
- Understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Identify and analyze the essential concepts and key issues involved in Data Mining.
2. Identify the various concepts of machine learning involved in various fields of Artificial Intelligence
3. Apply the concepts Neural networks and Artificial neural networks in the field of Evolutionary computing
4. Analyze the various network models and AI hybrid systems in the design of Artificial Immune systems
5. Identify and Analyze the various advanced algorithms involved in Data analytics.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2				2									
2	2	2	1	1	2									
3	2		1											
4	2		2							2				2
5	2			3						2				

UNIT I **9 Hours**

THEORETICAL FOUNDATIONS

Data mining: fundamentals - data reduction - Decision tree algorithms - Association rules, Clustering: K-means, fuzzy c-means, hierarchical, probabilistic clustering methods

UNIT II **9 Hours**

LEARNING

Bayes Optimal Classifiers - Gibbs Algorithms - Supervised Learning - Unsupervised Learning - Reinforcement Learning - Adaptive Learning EM Algorithm - Probability Learning - Knearest Neighbour Learning - Regression - Case Based Learning - collaborative learning - cognitive approach to learning and prediction

UNIT III **9 Hours**

EVOLUTIONARY COMPUTING

Neural Networks - Back propagation Networks - Hopfield Neural Networks - Radial Basis Function Networks - Learning Vector Quantisation - Artificial Neural Networks fuzzy Classifiers - Fuzzy Cognitive Maps - Collective Intelligence - Swarm Intelligence - Ant routing - Adaptivity and self-organisation - quantitative emergence and control - Self Organising Feature Maps

UNIT IV **9 Hours**

ARTIFICIAL IMMUNE SYSTEMS

Scope - Framework - Algorithms - Network Models - Cognition and Immune Systems - Survey of Immune Systems, AI Hybrid systems: Case based reasoning - Classifier systems - Fuzzy systems - DNA computing - Case studies: Autonomous Navigation - Network Security - Job-shop scheduling

UNIT V **9 Hours**

ADVANCED TOPICS

Ant Colony Optimization -Particle Swarm optimization -Artificial Life Systems -Swarms in business intelligence - Human-swarm interaction - Behavioral Intelligence -flock based collaboration -fusion

FURTHER READING

Cognitive algorithms, Multicriteria Decision-Making and Computational intelligence in Big Data

Total: 45 Hours

Reference(s)

1. S. Sumathi, Surekha Paneerselvam, Computational Intelligence Paradigms: Theory & Applications Using MATLAB, CRC Press, 2009.
2. Russell C. Eberhart and Yuhui Shi, Computational intelligence: concepts to implementations, Morgan Kauffman, 2007.

3. John Fulcher, L. C. Jain, Computational intelligence: a compendium, Studies in computational -intelligence, Vol. 115, Springer, 2008.
4. Leandro N. De Castro, Jonathan Timmis, Artificial immune systems: a new computational intelligence approach, Illustrated edition, Springer, 2002.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	2				12	4																		20
2		2				2					12														16
3		2				2									4				4				12		24
4		2				2					12				4										20
5		2				2					12								4						20
Total																									100

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT0YG CYBER FORENSICS 3 0 0 3

Course Objectives

- Describe the types of computer forensics and the relationship between law enforcement and industry.
- List and describe the common legal issues related to electronic evidence.
- Identify and describe the categories of security threats and apply resolution technique to avoid and prevent from threats.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
j. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one`s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Analyze the ability to properly document a computer forensics investigation/analysis and create reports.
2. Identify standards of professionalism and ethical behavior for information security and digital forensics professionals, and apply these standards successfully to ethical dilemmas.
3. Evaluate the issues related to threats and determine how to overcome them technically and ethically.

4. Analyze the methods that how to save us from terrorists and study of military tactics.
5. Evaluate the surveillance tools, cyber crime and cyber laws.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		1			3		1	1		3		2	1
2		3	2			3		3		2	1		2	
3		2	3	3				2		3		2		2
4		1			2		2	3		2	2	1	2	2
5	2			1		3		2		3		3		2

UNIT I **9 Hours**

TYPES OF COMPUTER FORENSICS

Computer Forensics Fundamentals -Types of Computer Forensics Technology -Types of Vendor and Computer Forensics Services.

UNIT II **9 Hours**

DATA RECOVERY

Data Recovery -Evidence Collection and Data Seizure -Duplication and Preservation of Digital Evidence -Computer Image Verification and Authentication.

UNIT III **9 Hours**

ELECTRONIC EVIDENCE

Discover of Electronic Evidence -Identification of Data -Reconstructing Past Events -Networks.

UNIT IV **9 Hours**

THREATS

Fighting against Macro Threats -Information Warfare Arsenal -Tactics of the Military -Tactics of Terrorist and Rogues -Tactics of Private Companies.

UNIT V **9 Hours**

SURVEILLANCE

Future -Arsenal -Surveillance Tools -Victims and Refugees -Advanced Computer Forensics.

FURTHER READING

Cyber Crimes, Cyber Laws and Malware Analysis

Total: 45 Hours

Reference(s)

1. John R. Vacca, "Computer Forensics", Firewall Media, 2004.
2. Chad Steel, "Windows Forensics", Wiley India, 2006.
3. Majid Yar, "Cybercrime and Society", Sage Publications, 2006.
4. Robert M Slade, "Software Forensics", Tata McGraw Hill, 2004

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2					14					2			2											20
2	2					2					12			4											20
3											4				12			4							20
4						12									4								4		20
5		2				14					4														20
Total																									100

Assessment Questions

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT0YH DATABASE PROGRAMMING 3 0 0 3

Course Objectives

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. Formulate solutions to queries using conditional expressions, logical connectives, functions, procedures, triggers and cursors.
2. Install and configure DBMS server software, maintain database security, backup and recovery policies.
3. Elucidate the influence of the underlying computer architecture on the database system.
4. Interpret the issues of database design, transaction management, and query evaluation and optimization and issues of system availability during failures.
5. Solve the issues in the management of mobile and personal databases using advanced transaction processing.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3		3								1	1
2	1	3	2		3								1	1
3	1	3	1		2								1	1
4	1	3	1		2								1	1
5	1	3	1		2								1	1

UNIT I **9 Hours**

DATABASE QUERY

Introduction: DML, DDL, DCL, TCL - Case - When - Null- If Null- COALESCE - In-Not In- All - Some- Any- And - Or - Not - Sub Query - Pl/Sql - Functions- Stored Procedures - Triggers - Cursors.

UNIT II **9 Hours**

DATABASE ADMINISTRATION

Database Users - DBA - Roles - Installation - User Creation- Privileges- Database Backup- Mirroring- Data Recovery- Database Tuning

UNIT III **9 Hours**

DATABASE-SYSTEM ARCHITECTURES

Database system architectures: Centralized and Client Server Architectures- Server System Architectures- Parallel Systems- Distributed Systems- Network Types. Parallel Databases: Introduction- I/O Parallelism- Inter query Parallelism- Intra query Parallelism- Intra operation Parallelism- Inter operation Parallelism.

UNIT IV **9 Hours**

DISTRIBUTED DATABASE

Distributed Databases: Homogeneous and Heterogeneous Databases- Distributed Data Storage- Distributed Transactions- Commit Protocols- Concurrency Control in Distributed Databases- Availability- Distributed Query Processing- Heterogeneous Distributed Databases Cloud- Based Databases- Directory Systems

UNIT V **9 Hours**

MOBILITY AND TRANSACTION PROCESSING

Spatial, Temporal Data and Mobility: Time in Databases- Spatial and Geographic Data- Multimedia Databases- Mobility and Personal Databases. Transaction Processing: Transaction Processing Monitors- Transnational Workflows- E-Commerce- Main Memory Databases- Real-Time Transaction Systems- Long-Duration Transactions.

FURTHER READING:

XML databases, Web databases, Cloud based databases, Introduction to Big-data.

Total: 45 Hours

Reference(s)

1. Allen G.Taylor, "SQL for Dummies", 5th Edition.
2. Abraham Silberschatz, Henry F.Korth, S.Sundarshan, "Database System Concepts", 6th Edition.
3. Carlos Coronel, Steven Morris "DATABASE SYSTEMS, Design, Implementation and Management", 12th Edition.
4. Ramez Elmasri,Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson, Sixth Edition, 2010.
5. Raghu Ramakrishnan, "Database Management Systems", Third Edition, McGraw Hill, 2012.
6. http://www.mysqltutorial.org/

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions
Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT0YI CLOUD ARCHITECTURE AND MANAGEMENT

3 0 0 3

Course Objectives

- Understand the concept of NIST cloud architecture and its components.
- Familiar with components of openstack platform for establishing private cloud
- Gain knowledge on HDFS, Google File system, iCloud file system, Docker and container services.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Analyze the various Hypervisors and select the right hypervisor model to deploy the cloud environment.
2. Analyze the networking configuration and security configuration in OpenStack for Web interface
3. Investigate the different types of file system and design cloud storage architecture for data management storage architecture for data management.
4. Analyze the various storage techniques and choose the best technique for implementing in an organization technique for implementing in an organization.
5. Analyze the different storage techniques adopted by various service providers to deploy cloud service providers to deploy cloud.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2			3	2								-	
2	1	2	3		2								-	
3		1		3	2								-	
4	1		3	2	1								-	
5		1		2	3								-	

UNIT I **9 Hours**

CLOUD COMPUTING OVERVIEW

Introduction to cloud - service models - Virtualization basics - Hypervisors -OpenStack Architecture - Keystone Architecture - Glance Architecture - Nova service architecture - nova-compute - compute resource management

UNIT II **9 Hours**

NETWORKING BASICS

Networking basics - Virtual LAN - Creating a network - External network access - Web interface external network setup - Dashboard - managing flavors, keypairs - launching an instance - managing security groups, floating ip address - web interface

UNIT III **9 Hours**

CLOUD STORAGE ARCHITECTURE

Storage fundamentals - file system - Storage components - Data organization: File vs. Block, Object - Storage Area Network - Network Attached Storage - Storage Security - Storage Management - Device Management - RAID

UNIT IV **9 Hours**

STORAGE STACK

Storage stack: Device - Block - File - Object storage overview - Swift architecture - Components of object storage - Rings - Block storage - File management

UNIT V **9 Hours**

CASE STUDY

Hadoop Distributed file system - Google File system - iCloud file system - Docker and container services

Total: 45 Hours

Reference(s)

1. Dan Radez, Openstack Essentials, PACKT publishing, 2015
2. Omar Khedhar, Mastering Openstack, PackT Publishing, 2015
3. Nigel poulton, Data Storage Networking: Real World Skills for the CompTIA Storage+ Certification and Beyond, SyBEX (A wiley brand),2014
4. Alex Weeks,The Linux System Administrator's Guide, GNU free documentation License, 2004.
5. Rajkumar Buyya, Christian Vecchiola and Thamarai Selvi, Mastering Cloud Computing, Morgan Kaufmann, 2013.
6. Tom Adelstein, Bill Lubanovic,Linux System Administration, O'Reilly Media, 2007

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions
Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT0YJ LINUX STSTEM ADMINISTRATION 3 0 0 3

Course Objectives

- Understand essential tools to access a shell prompt and issue commands with correct syntax
- Operate running systems by identifying CPU/memory intensive processes, adjust process priority with renice, and kill processes
- Configure systems, web server to mount file systems at boot by Universally Unique ID (UUID)

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.

Course Outcomes (COs)

1. Manage user groups using the essential tools and handle files, directories with command-line environments
2. Identify and apply the processes and perform controlling services in Linux
3. Configure file systems and analyze the scheduling of tasks and cloning
4. Configure local storage and create the partitions and logical volumes for given development environment
5. Manage web server using Apache and email configuration using postfix for given development environment

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	3											
2	1	3	1											
3	1	3	2										1	
4	1	2	3										1	
5	1	2	2										2	

UNIT I **9 Hours**

BASIC SYSTEM CONFIGURATION

Linux Introduction - Overview of Kernel mode and User mode - System Locale and Keyboard Configuration - Configure Date and Time - Manage Local Linux Users and Groups - File-system Tree - Getting Help using Man Terminology - Creating, Viewing and Editing Text Files - Gaining Privileges

UNIT II **9 Hours**

INSTALLATION AND INFRASTRUCTURE SERVICES

YUM - Managing System Services - Process states - Monitoring and Managing Linux Processes - Controlling System on a Remote Machine - Configuring and Securing Open-ssh Service - Controlling Access to Files with Access Control Lists (ACL)

UNIT III **9 Hours**

FILE SYSTEM MANAGEMENT

Regular Expressions for searching using grep - Creating and Editing Text files with vi and vim - Scheduling Future Linux Tasks using at and cron - Managing Priority of Linux Processes - Common System files and log files - Cloning

UNIT IV **10 Hours**

STORAGE MANAGEMENT

Adding Disks, Partitions, and File Systems to a Linux System - Editing documents in Linux Environment - Logical Volume Management (LVM) Storage - Network Attached Storage with Network File System (NFS) - Network Storage with Samba (SMB)

UNIT V **8 Hours**

SERVER MANAGEMENT

Web Server: Apache Web Server - Configuring and working with Apache Web Server - Setting up Email Servers using postfix

Total: 45 Hours

Reference(s)

1. Marie, Maxim Svistunov: Development, Configuration, and Administrator on Linux 7, redhat PRESS, 2015
2. Remy Card, Eric Dumas and Frank Mevel, "The Linux Kernel Book", Wiley Publications, 2003
3. M.N Rao, "Fundamentals of Open Source Software" PHI Learning, 2015
4. Wale Soyinka, Red Hat Linux Administration: A Beginner's Guide, McGraw-Hill Osborne Media, Sixth Edition, 2012
5. Terry Collings, Kurt Wall, Red Hat Linux Networking and System Administration, redhat PRESS, Third Edition, 2005
6. Wale Soyinka, Red Hat Linux Administration: A Beginner's Guide, McGraw-Hill Osborne Media, Sixth Edition, 2012

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions
Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15IT0XA ANDROID APPLICATION DEVELOPMENT

1 0 0 1

Course Objectives

- Design a GUI for Android applications
- Develop Android Apps for Real World Applications

Programme Outcomes (POs)

b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COs)

1. Develop a working knowledge of the custom UI elements and positioning
2. Build and deploy his/ her Android application

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3		1									
2		2	1		3							-		

UNIT I **6 Hours**

INTRODUCTION

Android architecture- Pillars (Activity, Intent, Services and Broadcast receivers)- Setting up android Development- Hello Android (Understanding Hello World Program)- MVC Pattern- Creating screens, layouts and Navigation - Styles and Themes - Fragments

UNIT II **11 Hours**

HANDS ON SESSION

Working with Android UI elements - multiple resolution- Camera - Multimedia files - Sqlite Database - Files - using GPS to get user location - Google Maps - Webview - Introduction to JSON - Invoking REST API.

UNIT III **1 Hours**

APPLICATION DEVELOPMENT

Multi flavor app with gradle - Publishing App to Google Play

Total: 18 Hours

Reference(s)

1. Michael Burton, Android App Development for Dummies, Wiley, Third edition, 2015
2. Carmen Delessio, Lauren Darcey, Shane Conder,Android Application Development in 24 Hours, Sams Teach Yourself (4th Edition) 4th Edition,2016

3. Jeff Friesen, Dave Smith , Android Recipes: A Problem-Solution Approach, Apress,1st Edition,2012
4. https://developer.android.com/design/index.html
5. http://www.vogella.com/tutorials/android.html
6. https://www.udacity.com/course/developing-android-apps--ud853

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15IT0XB PYTHON ESSENTIALS 1 0 0 1

Course Objectives

- Create and execute Python programs
- Install and run the Python interpreter

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. Apply basic concepts of Python to solve simple problems
2. Develop application programs using collections and Files
3. Construct the solutions for the real world problems using OOPS.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3	1										
2	1		2	3										
3			2											

UNIT I **6 Hours**

INTRODUCTION

Introduction - Comments - IO operations - Data types - Operators - Variables -Control Structures- String
Handling

UNIT II **6 Hours**

COLLECTIONS AND FILE HANDLING

Functions -Recurion - Lists - Tuples - Sets - Dictionaries -File Handling Operations Opening and closing files - Reading and writing files - Renaming and deleting files - Directories in Python

UNIT III **6 Hours**

EXCEPTION HANDLING AND OOP

Handling Runtime Errors - Exception Handling-Exceptions - Handling exceptions - Raising exceptions - user-defined exceptions
Object Oriented Programming in Python - Classes and Objects - Methods - Principles of Object Orientation - Inheritance - Polymorphism - Encapsulation

Total: 18 Hours

Reference(s)

1. Rick van Hattem,Mastering Python,Packt Publishing,2016
2. Paul Barry,Head First Python, 2nd edition, O'Reilly Media,2015
3. Mark Lutz,Learning Python, O'Reilly Media, 5th edition, 2013

4. https://docs.python.org/3/tutorial/
5. http://www.diveintopython.net/toc/index.html
6. http://www.learnpython.org/

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15IT0XC PERL PROGRAMMING 1 0 0 1

Course Objectives
Programme Outcomes (POs)
Course Outcomes (COs)
Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														

UNIT I **5 Hours**

INTRODUCTION

Introduction - Comments - IO operations - Data types - Operators - Variables -Control Structures - String Handling

UNIT II **6 Hours**

COLLECTIONS AND FILE HANDLING

Functions -Recurion - Lists - Tuples - Sets - Dictionaries -File Handling Operations Opening and closing files - Reading and writing files - Renaming and deleting files - Directories in Python

UNIT III **7 Hours**

EXCEPTION HANDLING AND OOPS

Handling Runtime Errors - Exception Handling Exceptions - Handling exceptions - Raising exceptions - user-defined exceptions

Object Oriented Programming in Python - Classes and Objects - Methods - Principles of Object Orientation - Inheritance - Polymorphism - Encapsulation

UNIT IV **1 Hours**

OPERATION ON STRING VARIABLES

In-built string methods - string formatting operations

UNIT V **1 Hours**

ADDITIONAL DATA STORAGE OBJECTS

Lists - Tuples - Sets - Dictionaries

UNIT VI **2 Hours**

MODULARITY AND CODE REUSABILITY ÃƒÂ¢?? FUNCTIONS

Defining a function - Calling a function - Pass by reference - Function arguments - return - statements - Scope of variables - Recursion - Import statement - from...import statement - from...import * statement

UNIT VII **4 Hours**

ADVANCED CONCEPTS

File Handling Operations

Opening and closing files - Reading and writing files - Renaming and deleting files - Directories in Python

Handling Runtime Errors - Exception Handling

Exceptions - Handling exceptions - Raising exceptions - user-defined exceptions

Object Oriented Programming in Python - Classes and Objects - Methods - Principles of Object Orientation - Inheritance - Polymorphism - Encapsulation

Total: 26 Hours

Reference(s)

1. Rick van Hattem,Mastering Python,Packt Publishing,2016
2. Paul Barry,Head First Python, 2nd edition, O'Reilly Media,2015
3. Mark Lutz,Learning Python, O'Reilly Media, 5th edition, 2013
4. https://docs.python.org/3/tutorial/
5. http://www.diveintopython.net/toc/index.html
6. http://www.learnpython.org/

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
6																									0
7																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15IT0XE CONTAINERIZING OPENSTACK SERVICES

1 0 0 1

Course Objectives

- Familiarize students with container technology and enable them to containerize OpenStack services

Programme Outcomes (POs)

c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Course Outcomes (COs)

1. Apply container technology for various openstack services

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			3											

UNIT I **15 Hours**

CONTAINERIZATION

Challenges in Enterprise Infrastructure Application Design, Introduction to containers and why we need them, Difference between Containers and Docker, Introduction to Ansible Kolla-Ansible Overview, Deployment of Controller, compute, Storage(LVM) and Network, Advantages of Kolla, Basic debugging

Total: 15 Hours

Reference(s)

1. https://www.openstack.org/containers/

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15IT0XF FLASK 1 0 0 1

Course Objectives

- understand the basic concepts of FLASK Framework
- develop web applications using flask framework

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. Build URL and send data using FLASK framework.
2. Create web applications using FLASK

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			2		1	2	1							
2	1		1		2	3								

UNIT I **6 Hours**

INTRODUCTION

Introduction - flask framework- How to set Environment for flask framework- Sample application- route () method - rules for variable definition - Building URL in flask framework.

UNIT II **6 Hours**

FLASK HTTP

Use of HTTP method in flask framework - Template and Render - static files - Request object - Sending form data to template.

UNIT III **6 Hours**

COOKIES AND SESSION

Cookies and session - redirect - errors - message flashing - database connectivity - sample application.

Total: 18 Hours

Reference(s)

1. Miguel Grinberg, A Flask Web Development: Developing Web Applications with Python, 1st edition, Kindle Edition, O'Reilly Media, 2014.
2. Ron DuPlain, Instant Flask Web Development, Packt Publishing, 2013.
3. https://www.accelebrate.com/training/python-flask.
4. https://www.tutorialspoint.com/flask/flask_overview.htm.

5. http://flask.pocoo.org/docs/0.12/tutorial/.
6. https://pythonspot.com/en/flask-web-app-with-python/.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15IT0XG ANGULAR JS 1 0 0 1

Course Objectives

- introduce the applications of AngularJS framework
- design and develop MVC based web applications using AngularJS

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. Create a component-based architecture for front-end applications
2. Develop web applications using Angular framework
3. Build and deploy applications with server

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3	1										
2	2	3	1	1										
3			3											

UNIT I **5 Hours**

INTRODUCTION

Introduction to web applications, front-end development approaches, javascript frameworks, Single Page Applications, Angular introduction.

Setting up the development environment
Javascript language & JSON overview, introduction to NodeJS, installing dependencies with Node Package Manager (NPM), Typescript overview, using the VS Code IDE, Angular CLI, committing code to Github.

UNIT II **7 Hours**

ANGULAR CONCEPTS

Angular concepts
Architecture - modules, components, templates, metadata, data binding, event binding, two-way binding, directives, services & dependency injection, pipes.

Creating an Angular application Project organization, routing basics, using the angular router, angular forms, master-detail components, testing and debugging.

UNIT III **3 Hours**

BACKEND INTEGRATION AND DEPLOYMENT

Backend integration

Overview of REST APIs, Promises and Observables, using the Angular HTTP client to receive and send data.

Build and deployment

Creating a production build with Angular CLI - what is webpack, minification, trees shaking, AOT, bundling. Hosting the application and going live.

UNIT IV **4 Hours**

ANALYZING AN ANGULARJS APP

The Application, Relationship between Model, Controller, and Template, The Model Controllers, Directives, and Services, AngularJS Filters.

UNIT V **4 Hours**

COMMUNICATING WITH SERVERS

Communicating Over http, Directives and HTML Validation, API Overview, AngularJS Module Methods, Internationalization and Localization.

Total: 23 Hours

Reference(s)

1. Brad Green, Shyam Seshadri ,Angular JS, O'Reilly Media, 2013.
2. Rodrigo Branas, Design and construct reusable, maintainable, and modular web applications with AngularJS Packt Publishing, 2014.
3. Brad Dayley , Learning Angular JS, First Edition Pearson Education, 2015.
4. https://docs.angularjs.org/tutorial.
5. https://angular.io/docs

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15IT0XH GRAPHICS DESIGN USING CORALDRAW 1 0 0 1

Course Objectives

- Design pages with shapes, bitmaps and perform actions
- Create high look and feel pages using CORALDRAW

Programme Outcomes (POs)

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Create pages, shapes and objects for simple applications
2. Apply text effects and layers for designing high look and feel pages
3. Design pages with special effects

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			2		3									
2			1		3									
3			2		3									

UNIT I **6 Hours**

INTRODUCTION

Exploring the user Interface - Working with Page Layout -Previewing a Drawing - Undoing & Redoing of Actions - Working with Basic Geometric Figures - Modifying and performing operations - Working with Objects - Colors and Bitmaps.

UNIT II **4 Hours**

WORKING WITH TEXT AND LAYERS

Exploring the Text Types - Converting - Changing the Appearance -Applying Text Effects - Creating the Layers - Modifying Layer Properties.

UNIT III **8 Hours**

SPECIAL EFFECTS

BRUSHES AND OBJECT STYLE

Brush Strokes -Present and Customized Brush Strokes - Styles and Style sets - Creation, Applying and Editing - Envelope Tool- Distort Tool - Blend & Contour Tool - Perspective Effects -Setting Printer Properties and Exporting

UNIT IV **4 Hours**

BRUSHES AND OBJECT STYLE

Brush Strokes -Present and Customized Brush Strokes - Styles and Style sets - Creation, Applying and Editing.

UNIT V **4 Hours**

SPECIAL EFFECTS

Envelope Tool- Distort Tool - Blend & Contour Tool - Perspective Effects -Setting Printer Properties and Exporting

Total: 26 Hours

Reference(s)

1. Kogent Learning, Corel Draw X7 in Simple Steps, Dreamtech Press, 2014.
2. Gary David Bouton ,Corel DRAW X7: The Official Guide, Mcgraw Hill Education, 2015.
3. Foster D. Coburn, CorelDRAW: Unleashed, Sams Publications, 2009.
4. http://www.coreldraw.com/en/pages/800382.html.
5. http://entheosweb.com/tutorials/coreldraw.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15IT0XJ CODE IGNITER: A PHP FRAMEWORK 1 0 0 1

Course Objectives

- Understand code Igniter for efficient web application creation

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze complex IT related engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex IT related engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
m. Ability to design and develop cost effective, secure, reliable IT, network and web based solutions with professional expertise in the domains including banking and healthcare and communications.
n. Ability to identify and analyze large and heterogeneous data by applying suitable machine and deep learning algorithms and analytical tools to enable information retrieval and decision making in scientific and business applications.

Course Outcomes (COs)

1. understand the basics of code igniter
2. create a sample web page
3. develop an advanced web application using code igniter

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		3											
2		2	3			1							2	
3				2			1							2

UNIT I **5 Hours**

WEBSITE NECESSITIES, CODEIGNITER BASICS

Introduction & Features- Overview of WAMP Server Installation-Introduction to Website Programming -HTML CSS - JavaScript & JQuery - Introduction to Server Side Programming -PHP - Handling MySQL Queries in Database. Introduction to MVC Architecture - Downloading and initializing the codeigniter. Setting up the first MVC

UNIT II **5 Hours**

CODEIGNITER: ACTIVE RECORDS, USER INTERFACE, FORMS

Initial Setup and Configuration - Config Class, Database Class, Loader Class, Libraries, Routing, Active Records - SELECT, INSERT, INSERT BATCH, UPDATE, BATCH UPDATE, DELETE, JOINS, Developing pages with the help of Active Records, Setting Up Pagination. Creation of Login Pages with the help of forms, Insert queries and Update for User Interaction.

UNIT III **5 Hours**

CODEIGNITER: FILE UPLOAD, IMAGE RESIZING, COMMENTS, CAPTCHA, HERLPER

Codeigniter File Upload, Resizing Images, Creation of Mail List, Comments - MVC Captcha - Helpers, Setting up a Calendar, Setting up a Shopping Cart.

Total: 15 Hours

Reference(s)

1. Eliahou Orr, Yehuda zadik,Programming with Codeigniter MVC, Kindle Edition, Packt Publishing.
2. Timi Ogunjobi,Codeigniter Manual, web sesame, First Edition

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15IT0XK WEB APPLICATION USING WORDPRESS 1 0 0 1

Course Objectives

- create web pages using css and scripting languages
- design, devlop and deploy web applications using wordpress

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Information Technology specialization to the solution of complex engineering problems.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Design web pages using CSS and Javascript and Jquery
2. Develop web pages using wordpress
3. Build and Deploy web applications using wordpress

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2					2									
3					3									

UNIT I **5 Hours**

CMS: INTRODUCTION, INSTALLATION

Overview of CMS-Introduction & Features- Overview of WAMP Server-Installation-Introduction to Website Programming-HTML - CSS - JavaScript & JQuery - Introduction to Server Side Programming-PHP- Handling MySQL Queries in database.

UNIT II **6 Hours**

WORDPRESS: INTRODUCTION, INSTALLATION

Overview of Wordpress - Introduction & Features - Course Introduction and Orientation-Systems Administration for Wordpress Developers - Understanding the Dashboard - Understanding Themes - Understanding Plug-ins - Creating Menus.

UNIT III **6 Hours**

CONTENT CREATION

Installing Demo Theme- Getting Familiar with the Menu - Changing our Main Page - Adding a Logo and Favicon - Editing the Features Section - About Section - Video Light Box -Services Area - Clients, Counters and News - Footer Section.

Total: 17 Hours

Reference(s)

1. Brad Williams, David Damstra, and Hal Stern, Professional WordPress Design & Development, 3rd Ed. Wiley,2015
2. Jesse Friedman, Web Designers guide to Wordpress Copyright 2015

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15GE0P3 APPLIED LASER SCIENCE 3 0 0 3

Course Objectives

- Impart knowledge on laser science
- Explore different strategies for producing lasers
- Create expertise on the applications of lasers in various fields

Programme Outcomes (POs)
Course Outcomes (COs)

1. Illustrate the transition mechanisms and the components of a laser system
2. Compare the different types of lasers based on pumping method, active medium and energy levels
3. Compute the rotation of earth, velocity and distance using lasers and apply the same for day today applications
4. Analyze the role of lasers in surgical and endoscopy applications
5. Apply the laser techniques in industrial applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	1	2												
3	1	1												
4	2	2												
5	1	2												

UNIT I **9 Hours**

LASER FUNDAMENTALS

Introduction - principle - Einstein's prediction - spontaneous emission - stimulated emission - Einstein's relations - A and B coefficients - population inversion - condition for large stimulated emission - spontaneous and stimulated emission in optical region - light amplification. Components of lasers: active medium - pumping - pumping mechanisms - resonant cavity.

UNIT II **9 Hours**

CHARACTERISTICS AND TYPES OF LASERS

Introduction - directionality - intensity - coherence - monochromaticity. Classification of lasers - principle, construction, working, energy level diagram and applications of CO2 laser - dye laser - excimer laser - Nd:YAG laser - semiconductor laser.

UNIT III **9 Hours**

LASERS IN SCIENCE

Harmonic generation - stimulated Raman emission - lasers in chemistry - laser in nuclear energy - lasers and gravitational waves - LIGO - rotation of the earth - measurement of distance - velocity measurement - holography.

UNIT IV **9 Hours**

LASERS IN MEDICINE AND SURGERY

Eye laser surgery - LASIK - photocoagulations - light induced biological hazards: Eye and skin - homeostasis - dentistry - laser angioplasty - laser endoscopy - different laser therapies.

UNIT V **9 Hours**

LASERS IN INDUSTRY

Applications in material processing: laser welding - hole drilling - laser cutting. Laser tracking: LIDAR. Lasers in electronics industry: ranging - information storage - bar code scanner. Lasers in defence: laser based military weapons - laser walls.

FOR FURTHER READING

Q-switching - mode locking - thermo-optic effects - astronomy lasers - fighting crime with lasers - laser engraving.

Total: 45 Hours

Reference(s)

1. K. Thiyagarajan and A. K. Ghatak, LASERS: Fundamentals and Applications, Springer, USA, 2015.
2. M. N. Avadhanulu, An Introduction to Lasers Theory and Applications, S. Chand Publisher, 2013.
3. W. Koechner, M. Bass, Solid State Lasers: a graduate text, Springer Verlag, New York, 2006.
4. K. P. R. Nair, Atoms, Molecules and Lasers, Narosa Publishing House, 2009.
5. K. R. Nambiar, Lasers: Principles Types and Applications, New Age International Publications, 2006.
6. A. Sennaroglu, Solid-State Lasers and Applications, CRC Press, 2006.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	2			2	2	1		2	3	1			2			1	2							20
2	2	2			3	2	2		2	2			1	1			1		2						20
3	3				2	2	1		2		3		2	1	1			1	2						20
4	2	2			2	1	1		2	2	1		2	2	1			1	1						20
5	2	1			1		3		2		2		2	1			1	2	3						20
Total																									100

Assessment Questions

Remember

1. Recognise the term LASER
2. Define stimulated absorption
3. Define spontaneous emission
4. Define stimulated emission
5. Distinguish between spontaneous and stimulated emission
6. State population inversion
7. List the four characteristics of lasers
8. Mention the five medical applications of lasers
9. State the principle behind the holography
10. Recall the term resonant cavity

Understand

1. Identify the condition needed for laser action
2. Interpret the pumping of atoms
3. Exemplify the optical excitation occurs in three level laser systems
4. Explain the determination of rotation of earth using laser
5. Summarize the application of lasers in welding and cutting
6. Explain the term LASIK
7. Classify the different types of lasers based on materials
8. Illustrate the working of laser in material processing

Apply

1. Predict the condition for laser action
2. Derive the Einstein's A and B coefficients
3. Deduce the expression for large stimulated emission
4. Construct the experimental setup for distance measurement
5. Find the applications of lasers in stimulated Raman
6. Assess the wavelength of emission of GaAs semiconductor laser whose bandgap energy is 1.44 eV.

Analyse

1. Laser beam should be monochromatic, Justify?
2. Differentiate ordinary light source from laser source
3. Compare the working of gas lasers with excimer laser
4. Four level laser systems are more efficient than three level laser systems. Justiify**?**

Evaluate

1. Determine the intensity of laser beam be focused on an area equal to the square of its wavelength. For He-Ne laser wavelength is 6328 A^0 and radiates energy at the rate of 1mW.
2. Choose the appropriate lasers for the materials processing in industry

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15GE0C1 CORROSION SCIENCE 3 0 0 3

Course Objectives

- Recognize the terminologies used in corrosion science.
- Impart knowledge about the various types of corrosion and its mechanism.
- Understand the various methods of corrosion control, corrosion testing and monitoring.

Programme Outcomes (POs)

Course Outcomes (COs)

1. evaluate if corrosion can occur under specific operating conditions in a given equipment or construction and indicate regions of immunity, corrosion and passivity of a metal
2. compare different corrosion types on metals when exposed to air, water and at high temperatures (> 100 C)
3. identify the corrosion mechanism on steel, iron, zinc and copper metal surfaces
4. calculate the rate of corrosion on metals using electrochemical methods of testing
5. propose the correct materials, design and operation conditions to reduce the likelihood of corrosion in new equipment and constructions

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1											
2		2												
3		3	1											
4		1	2											
5		3												

UNIT I **9 Hours**

CORROSION

Importance of corrosion - spontaneity of corrosion - passivation - direct and indirect damage by corrosion - importance of corrosion prevention in industries - area relationship in both active and passive states of metals - Pilling Bedworth ratio and its significance - units of corrosion rate (mdd and mpy) - importance of pitting factor - Pourbaix digrams of Mg, Al and Fe and their advantages and disadvantages.

UNIT II **7 Hours**

TYPES OF CORROSION

Eight forms of corrosion: uniform, galvanic, crevice corrosion, pitting, intergranular corrosion, selective leaching, erosion corrosion and stress corrosion. High temperature oxidation, kinetics of protective film formation and catastrophic oxidation corrosion.

UNIT III **9 Hours**

MECHANISM OF CORROSION

Hydrogen embrittlement - cracking - corrosion fatigue - filliform corrosion - fretting damage and microbes induced corrosion - corrosion mechanism on steel, iron, zinc and copper metal surfaces - thick layer and thin layer scale formation - in situ corrosion scale analysis.

UNIT IV **10 Hours**

CORROSION RATE AND ITS ESTIMATION

Rate of corrosion: factors affecting corrosion - electrochemical methods of polarization - Tafel extrapolation polarization, linear polarization, impedance techniques - weight loss method - susceptibility test - testing for intergranular susceptibility and stress corrosion. Visual testing - liquid penetrant testing - magnetic particle testing - eddy current testing.

UNIT V **10 Hours**

CORROSION CONTROL METHODS

Fundamentals of cathodic protection - types of cathodic protection. Stray current corrosion problems and its prevention. Protective coatings: anodic and cathodic coatings - metal coatings: hot dipping (galvanizing, tinning and metal cladding) - natural inhibitors. Selection of sacrificial anode for corrosion control.

FOR FURTHER READING

Corrosion issues in supercritical water reactor (SCWR) systems.

Total: 45 Hours

Reference(s)

1. Mouafak A. Zaher, Introduction to Corrosion Engineering, CreateSpace Independent Publishing Platform, 2016.
2. E.McCafferty, Introduction to Corrosion Science, Springer; 2010 Edition, January 2010.
3. R. Winstone Revie and Herbert H. Uhlig, Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering, 4th Edition, John Wiley & Science, 2008.
4. Mars G. Fontana, Corrosion Engineering, Tata McGraw Hill, Singapore, 2008.
5. David E.J. Talbot (Author), James D.R. Talbot, Corrosion Science and Technology, Second Edition (Materials Science & Technology), CRC Press; 2nd Edition, 2007.
6. http://corrosion-doctors.org/Corrosion-History/Eight.htm

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	1	2	2		1	2	1		1	1	1		1	1	2		2	1			1				20
2	1	3			2	1	1			2			1	2			1	1					1		16
3	2	1			1	4	1			3				2			2	2				2			20
4	1	1	1		2	3	1		2	2	1		2	1	1		1	2					1		22
5	1	2			1	2			2	3			2	3			1	2			1	2			22
Total																									100

Assessment Questions

Remember

1. Define Corrosion
2. Mention the five types of corrosion
3. Define dry corrosion. Explain the mechanism.
4. What are corrosion inhibitors? Give two examples.
5. What are corrosion inhibitors? Give two examples.
6. Write the working principle of Tafel polarization techniques.
7. How polarization and impedance techniques are used to measure the corrosion products?
8. Define cathodic protection.
9. ellaborate non-electrochemical and electrochemical methods of corrosion testing and monitoring.

10. What is Tafel linear polarization?
11. What is Tafel linear polarization?
12. In corrosion, which criteria involves nature of the metal
    a. Temperature
    b. Humidity
    c. pH
    d. Purity of the metal
13.
    1. An example of corrosion measurement technique is
    b. Tribometer
    c. non-destructive testing
    d. rupture testing
    e. Charpy test
14.
0. In the weight loss method, the preferred duration of exposure of test samples to corrosive media is
    a. 10 days
    b. 1 month
    c. 1 year
    d. 1 day
15.
0. The long term corrosion protection method is
    a. Impressed current method
    b. Proper choice of metal for the designing
    c. Cathode protection
    d. Sacrificial anode method
16. Indicate two purposes of corrosion testing.
17. Write the principal of anodic protection method.

Understand

1. Explain the mechanism of electrochemical corrosion.
2. Identify the relation between the two units used to measure corrosion rate.
3. Illustrate the Pourbaix digrams of Mg/Al/Fe and their limitations.
4. List the eight forms of corrosion. Explain each type with an example.
5. What are the factors influencing the corrosion rate? Explain.
6. Discuss the Pilling-Bedworth rule.
7. Differentiate between electrochemical and dry corrosion.
8. How inhibitors are used to protect the corrosion rate of the metal? Explain.
9. What are consequences of Pilling-Bedworth ratio?
10. List the difference between filliform corrosion and pitting corrosion.
11. By which method can we prevent corrosion in ship hulls?
    a. Sacrificial anode method
    b. Impressed current method
    c. Deaeration method
    d. Deactivation method
12.
    1. In order to form a protective oxide layer, the ratio of the volume of oxide formed to that of metal consumed should be
    b. greater than one
    c. less than one
    d. much greater than one
    e. none of the above
13. Stress corrosion is often observed in

. Welding
a. Boilers
b. Alloys
c. Quenching of metals

14. A very dangerous form of corrosion which is difficult to monitor is
. Galvanic
a. Pitting
b. Crevice
c. Stress
15. The method to overcome the disadvantages of Tafel plot is
. Weight loss method
a. linear polarization
b. organic coating
c. non-destructive test
16. In sacrificial anodic protection
. an artificial cathode is connected to the metal to be protected
a. an anodic metal is coated on the surface of the metal to be protected
b. protection of the metal given by galvanizing the metal
c. an artificial anode is connected to the metal to be protected
17. ……..is mostly used in sacrificial anode method.
. Zinc
a. Magnesium
b. Copper
c. Platinum
18. Corrosion can be prevented by
. Alloying
a. Tinning
b. Galvanizing
c. all of above
19. Which of following metals could provide cathodic protection to Fe?
. Al & Cu
a. Al & Zn
b. Zn & Cu
c. Al & Ni
20. Galvanization is
. coating Zn on steel
a. coating steel on steel
b. coating SiC on steel
c. coating rubber on steel
21. What is Tafel equation? Mention its application.
22. How is corrosion minimized by proper designing of equipment?
23. Mention the three visual corrosion testing methods.
24. Indicate the principles of cathodic protection.
25. Describe sacrificial anode with two examples.
26. What is a sacrificial anode? How does it protect a submerged pipeline?
27. Discuss the susceptibility tests for intergranular corrosion.
28. With a neat sketch of diagram, explain the principal and applications of impressed current method.

Apply

1. Area relationship between the anodic and cathodic part in galvanic corrosion. Discuss.
2. Describe alternatives to protective coatings.
3. How Tafel polarization and impedance techniques used to measure the corrosion products?

4. Name any two polarization methods for corrosion testing and monitoring.
5. Mention any two applications of susceptibility test.
6. Differentiate corrosion measurement from corrosion monitoring
7. Define cathodic protection? Under what conditions is this protection more useful?
8. Illustrate Tafel extrapolation polarization for the determination of corrosion rate.
9. Illustrate Tafel extrapolation polarization for the determination of corrosion rate.
10. Illustrate Tafel extrapolation polarization for the determination of corrosion rate.
11. Discuss the determination of corrosion rate by weight loss method.
12. Explain the control of corrosion by the use of sacrificial anodes and by impressed current cathodic protection.

Analyse

1. Explain why corrosion rate of metal is faster in aqueous solution than atmosphere air?
2. Why pitting corrosion is localized corrosion? Explain.
3. Compare the effects of corrosion products.
4. Identify different forms of corrosion in the metal surface.
5. What are the major implications of enhanced techniques of corrosion product analysis?
6.
    1. When zinc is coupled to steel and corrosion is tested in various environments, which one of the following happens?
    b. The corrosion rate of steel increases while that of zinc is decreased
    c. The corrosion rate of zinc is increased while that of steel is decreased
    d. The corrosion rates of both decrease
    e. The corrosion rates of both increase
7. Which corrosion control technique is most suitable inthe case of buried iron pipelines?
    . Sacrificial anodic method
    a. Impressed current cathodic protection
    b. Electroplating
    c. Cathodic inhibitors
8. Outline the draw backs of cathodic protection?
9. For what purpose Mg bars are used in ships?
10. List any four corrosion inhibitors.
11. Discuss the importance of design and material selection in controlling corrosion.
12. Differentiate sacrificial anodic protection from impression current method.
13. Analyze the role of sacrificial anode method in the prevention of corrosion.
14. Explain how corrosion of metals controlled by sacrificial anode technique.
15. Compare sacrificial anode method and impressed current method.
16. List and explain the 6 design rules that should be followed to prevent corrosion.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15GE0C2 ENERGY STORING DEVICES AND FUEL CELLS

3 0 0 3

Course Objectives

- Understand the concept, working of different types of batteries and analyze batteries used in electric vehicles.
- Identify the types of fuel cells and to relate the factors of energy and environment.
- Analyze various energy storage devices and fuel cells.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Analyze the parameters required for operation of a cell to evaluate the capacity of energy storage devices
2. Identify the electrodes, electrolyte and cell reactions of different types of primary, secondary batteries and infer the selection criteria for commercial battery systems with respect to commercial applications
3. Differentiate fuel cells based on its construction, production of current and applications
4. Identify different methods for the production of hydrogen fuel and its environmental applications
5. Relate energy and environmental based on the importance and types of renewable energy for sustainable development

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		2												
3		3												
4	2	1												
5		3	1											

UNIT I **6 Hours**

BASICS OF CELLS AND BATTERIES

Components - classification - operation of a cell - theoretical cell voltage - capacity - specific energy - energy density of practical batteries - charge efficiency- charge rate - charge retention - closed circuit voltage, open circuit voltage current density - cycle life - discharge rate-over charge-over discharge.

UNIT II **10 Hours**

BATTERIES FOR PORTABLE DEVICES AND ELECTRIC VEHICLES

Primary batteries- zinc-carbon, magnesium, alkaline, manganous dioxide, mercuric oxide, silver oxide batteries - recycling/safe disposal of used cells. Secondary batteries - introduction, cell reactions, cell representations and applications - lead acid, nickel-cadmium and lithium ion batteries - rechargeable zinc alkaline battery. Reserve batteries: Zinc-silver oxide, lithium anode cell, photogalvanic cells. Battery specifications for cars and automobiles.

UNIT III **10 Hours**

TYPES OF FUEL CELLS

Importance and classification of fuel cells - description, working principle, components, applications and environmental aspects of the following types of fuel cells: alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate and direct methanol fuel cells.

UNIT IV **10 Hours**

HYDROGEN AS A FUEL

Sources and production of hydrogen - electrolysis - photocatalytic water splitting - biomass pyrolysis -gas clean up - methods of hydrogen storage- high pressurized gas - liquid hydrogen type - metal hydride - hydrogen as engine fuel - features, application of hydrogen technologies in the future - limitations.

UNIT V **9 Hours**

ENERGY AND ENVIRONMENT

Future prospects of renewable energy and efficiency of renewable fuels - economy of hydrogen energy - life cycle assessment of fuel cell systems. Solar Cells: energy conversion devices, photovoltaic and photoelectrochemical cells - photobiochemical conversion cell.

FOR FURTHER READING

Energy conservation, Over utilization, Energy demanding activities.

Total: 45 Hours

Reference(s)

1. M. Aulice Scibioh and B. Viswanathan, Fuel Cells: Principles and Applications, University Press, India, 2009.
2. F. Barbir,PEM fuel cells: Theory and practice,Elsevier, Burlington, MA, Academic Press, 2013.
3. M. R. Dell Ronald and A. J. David, Understanding Batteries, Royal Society of Chemistry, 2001.
4. J. S. Newman and K. E. Thomas-Alyea, Electrochemical Systems, Wiley, Hoboken, NJ, 2012.
5. Shripad T. Revankar, Pradip Majumdar, Fuel Cells: Principles, Design, and Analysis, CRC Press, 2016.
6. Thomas B. Reddy, Linden's Handbook of Batteries, 4th Edition, McGraw Hill Professional, 2010

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	2	2			1	2	2			1			1	3				1							15
2	4	1			4	5	2			2			1	2				1							22
3	3				4	6	2		1	3			1	1				1							22
4	1	2			4	4	1			4			2	4											22
5	2	2			2	5				3			2	3											19
Total																									100

Assessment Questions

Remember

1. How galvanic cell is differing from electrolytic cell?

2. How is the potential of an electrochemical cell calculated?
3. List any four characteristics of primary batteries.
4. Mention any two characteristics and applications of zinc-carbon battery.
5. Recognize any two applications and characteristics of primary magnesium batteries.
6. Identify the applications and characteristics of Zn/HgO primary batteries.
7. Indicate any two applications of Zn/alkaline/MnO_2 battery.
8. Mentioned any two applications of Zn/Ag_2O primary battery.
9. Define capacity of a cell
10. Define discharge rate of a battery.
11. Describe the construction, cell reaction and applications of zinc-carbon battery.
12. Explain the construction, chemistry, advantages and uses of mercuric oxide battery.
13. Explain the major components and reaction of direct methanol fuel cell. List two applications.
14. Explain the working principle, components and applications of alkaline fuel cells
15. Discus the conversion of sunlight into electrical power in photoelectrochemical cells.

Understand

1. Mention the five different types of energy storage devices
2. Define the term battery
3. List any two differences between battery and cell.
4. Mention the three major components of cell.
5. Classify the batteries based on their cell reversibility.
6. Define cycle Life of a cell.
7. Explain the construction, cell reaction and applications of silver oxide batteries.
8. With a neat sketch explain the construction and working of phosphoric acid fuel cell.
9. Explain the major components and reactions of direct methanol fuel cell
10. Explain the production of hydrogen photobiochemical conversion cell.

Apply

1. Specific gravity is an indicator of charge in lead acid battery – Justify.
2. Illustrate the process of water electrolysis for the production of hydrogen.
3. How is the potential of an electrochemical cell calculated?
4. How is the potential of an electrochemical cell calculated?

Analyse

1. In the mid-winter car battery is not working –reason out.
2. Discuss the hydrogen energy strategies for sustainable development.
3. How galvanic cell is differing from electrolytic cell?
4. How batteries are rated?
5. Differentiate between primary and secondary batteries.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15GE0C3 POLYMER CHEMISTRY AND PROCESSING

3 0 0 3

Course Objectives

- Impart knowledge on the basic concepts of polymers and its mechanism
- Use the appropriate polymerization techniques to synthesize the polymers and its processing
- Select the suitable polymers for various applications

Programme Outcomes (POs)
Course Outcomes (COs)

1. Illustrate the types of mechanism of polymerization reactions and analyze the natural and synthetic polymers
2. Identify the suitable polymerization techniques to synthesize the high quality polymers
3. Characterize the polymers to identify the structural, thermal ,mechanical and electrical features for specific applications
4. Apply the polymer processing methods to design polymer products
5. Identify and analyze the polymers used in electronic and biomedical applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3	2											
2			2		2									
3		1			3									
4	1	2	1											
5		2												

UNIT I **10 Hours**

POLYMERS AND ELASTOMERS

Classification of polymers - Mechanism: Addition polymerization - free radical polymerization - cationic, anionic and co-ordination (Ziegler-Natta) polymerization, copolymerization, condensation polymerization (nylon-6,6) ring opening polymerization (nylon-6). Elastomers: Natural rubber - vulcanization - synthetic rubber: styrene -butadiene rubber (SBR), butyl, neoprene, thiocol rubbers. High performance polymers: polyethers, polyether ether ketone(PEEK), polysulphones, polyimides.

UNIT II **8 Hours**

POLYMERIZATION TECHNIQUES

Homogeneous and heterogeneous polymerization - bulk polymerization (PMMA, PVC) solution polymerization - polyacrylic acid, suspension polymerization (ion-exchange resins) - emulsion polymerization (SBR) - advantages and disadvantages of bulk and emulsion polymerization. Melt solution and interfacial poly-condensation.

UNIT III **8 Hours**

CHARACTERIZATION AND TESTING

Characterization of polymers by Infrared Spectroscopy (IR) and Nuclear Magnetic Spectroscopy (NMR) - Thermal properties by TGA and DSC, Testing tensile strength, Izod impact, Compressive

strength, Rockwell hardness, Vicot softening point. Test for electrical resistance, dielectric constant, dissipation factor, arc resistance and dielectric strength - water absorption.

UNIT IV **9 Hours**

POLYMER PROCESSING

Moulding: Compression - injection - extrusion and blow mouldings. Film casting - calendering. Thermoforming and vacuum formed polystyrene - foamed polyurethanes. Fibre spinning: melt, dry and wet spinning. Fibre reinforced plactics fabrication: hand-layup - filament winding and pultrusion.

UNIT V **10 Hours**

SPECIALITY POLYMERS

Preparation and properties of heat resistant and flame retardant polymers. Polymers for electronic applications: liquid crystalline, conducting and photosensitive polymers. Polymer for biomedical applications: artificial organs, controlled drug delivery, hemodialysis and hemofiltration.

FOR FURTHER READING

Biodegradable polymers

Total: 45 Hours

Reference(s)

1. V. R. Gowarikar, N. V. Viswanathan and Jayadev Sreedhar, Polymer Science, New Age International (P) Ltd., New Delhi, 2015.
2. Joel R. Fried, Polymer Science and Technology, Prentice Hall of India (P). Ltd., 2014
3. F. W. Billmeyer, Text Book of Polymer Science, John Wiley & Sons, New York, 2007
4. Barbara H. Stuart, Polymer Analysis, John Wiley & Sons, New York, 2008
5. George Odian , Principles of Polymerization, John Wiley & Sons, New York, 2004
6. R. J. Young and P. A. Lovell, Introduction to Polymers, CRC Press, New York, 2011

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	1	1	3		2	2	3		2	2	3		1	1	1										22
2	1	1	4		1	1	3		1	1	3		1	1											18
3	1	1	1		1	1			1	2	2			2			1	1	4						18
4	1				1	2	2		3	2	2		2	2	1								2		20
5	1	1	1		2	2	1		2	2	3		2	2	3										22
Total																									100

Assessment Questions

Remember

1. Recall two factors that govern termination of cationic polymerization.
2. Identify the monomers used in styrene -butadiene rubber.
3. Give an examples for the thermosetting and thermoplastic polymers.
4. What is copolymerization? Give an example
5. Name two synthetic polymers which are used for making textile fibres.
6. Define the role of Ziegler – Natta catalysts
7. List the examples of Ziegler – Natta catalysts.
8. Identify the four types of polymerization technique.
9. List any two disadvantages of suspension polymerization.

10. Point out the advantages of bulk polymerization technique.
11. Why does natural rubber need compounding?
12. List any four applications of injection moulding process.
13. List the various additives in processing of plastics.
14. List the two properties of heat resistant polymers .
15. Mention the application of flame retardant polymers.

Understand

1. Classify the polymers based on source
2. Discuss the addition and chain growth polymerization with example
3. Compare addition and condensation polymerization reaction with example for each type .
4. Explain homogeneous and heterogeneous polymerization.
5. Explain the mechanism involved in addition polymerization of vinylChloride
6. Explain the condensation polymerization method taking nylon 6,6,nylon synthesis as a representative example.
7. Discuss the preparation method and any three properties of Polysulphone.
8. Summaries the salient features, advantages and disadvantages of bulk and emulsion polymerization techniques.
9. Compare the homogeneous and heterogeneous polymerization method.
10. With a neat sketch, discuss the functioning of melt, dry and wet spinning process.
11. Illustrate the compression and extrusion moulding of plastics with diagram neat diagram.
12. Explain the coordination polymerization mechanism using a sutable example.

Apply

1. Relate the various steps involved in anionic and cationic polymerisation using suitable examples.
2. Select the suitable polymerization techniques for synthesis of PMMA and SBR
3. Assess the characterisation techniques used to find the structure of polymer .
4. Find the method to process the composite materials with example.
5. Execute the filament – winding Technique for manufacturing of rocket motor bodies.

Analyse

1. Distinguish between addition and condensation polymerisation.
2. Natural rubber need vulcanization –Justify.
3. Compare the salient features, advantages and disadvantages of solution and suspension polymerization techniques.
4. Bring out the differences between thermoforming and vacuum-forming process.
5. Outline the applications of polymer in controlled drug delivery and artificial organs.

Evaluate

1. Judge the biomedical applications of polymers in Hemo dialysis and hemo filtration.
2. Choose the suitable moulding Technique for polyvinyl chloride.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30

Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15GE0P1 NANOMATERIALS SCIENCE 3 0 0 3

Course Objectives

- Understand the fundamentals of physics of nanomaterials
- Correlate on multidisciplinary branch
- Acquire the knowledge in nanomaterials synthesis, compile and analyze data and draw conclusions at nano level

Programme Outcomes (POs)
Course Outcomes (COs)

1. Classify the size dependant properties of different nanomaterials
2. Explain different experimental methods used for the preparation of nanomaterials
3. Analyse the data using different characterization techniques
4. Illustrate the different techniques to synthesize semiconductor nanostructures and utilize them for application
5. Identify the impact of nanomaterials and their applications in Nano devices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		1	2											
3		2	1											
4	1	2												
5		1	1											

UNIT I **9 Hours**

NANO SCALE MATERIALS

Introduction-Feynman's vision-national nanotechnology initiative (NNI) - past, present, future - classification of nanostructures,nanoscale architecture - effects of the nanometer length scale - changes to the system total energy, and the system structures- effect of nanoscale dimensions on various properties -magnetic properties of nanoscale materials -differences between bulk and nanomaterials and their physical properties.

UNIT II **9 Hours**

NANOMATERIALS SYNTHESIS METHODS

Top down processes - mechanical milling, nanolithography and types based on radiations - Bottom up process - chemical vapour deposition, plasma enhanced CVD, colloidal and sol-gel methods - template based growth of nanomaterials - ordering of nanosystems, self-assembly and self-organization - DC sputtering and RF sputtering process.

UNIT III **9 Hours**

CHARACTERIZATION TECHNIQUES

General classification of characterization methods - analytical and imaging techniques - microscopy techniques - electron microscopy, scanning electron microscopy, transmission electron microscopy, atomic force microscopy - diffraction techniques - X-ray spectroscopy - thermogravimetric analysis of nanomaterials.

UNIT IV **9 Hours**

SEMICONDUCTOR NANOSTRUCTURES

Quantum confinement in semiconductor nanostructures - quantum wells, quantum wires, quantum dots, super lattices-epitaxial growth of nanostructures-MBE, metal organic VPE, LPE - carbon nano tubes- structure, synthesis and electrical properties -applications- fuel cells - quantum efficiency of semiconductor nanomaterials.

UNIT V **9 Hours**

NANOMACHINES AND NANODEVICES

Microelectromechanical systems (MEMS) and Nanoelectromechanical systems (NEMS)-fabrication, actuators-organic FET- principle, description, requirements, integrated circuits- organic LEDÃƒÂ¢??s - basic processes, carrier injection, excitons, optimization - organic photovoltaic cells- nano motors - bio nano particles-nano - objects - applications of nano materials in biological field.

FOR FURTHER READING

Application of graphene in various field - supercapacitors - third generation solar cell-dye sensitized solar cell (DSSC) -fuel cells.

Total: 45 Hours

Reference(s)

1. Willam A. Goddard, Donald W.Brenner, Handbook of Nanoscience, Engineering, and Technology, CRC Press, 2012.
2. Charles P. Poole Jr and. Frank J. Owens, Introduction to Nanotechnology, Wiley Interscience, 2007.
3. Guozhong Cao, Y. Wang, Nanostructures and Nanomaterials-Synthesis, Properties & Applications, Imperials College Press, 2011.
4. T. Pradeep, NANO: The Essentials Understanding Nanoscience and Nanotechnology, McGraw - Hill Education (India) Ltd, 2012.
5. Robert W. Kelsall, Ian W. Hamley, Mark Geoghegan, Nanoscale Science and Technology, John Wiley and Sons Ltd, 2006
6. Viswanathan B, AuliceScibioh M, Fuel cells: Principles and Applications, University Press, 2009.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	3	4	4		2					4				3					4						24
2	2	3	4		4	4				3				4											24
3	2	4	2			2	2				2			2											16
4		2			2	4				2				4					3						17
5	2	4				3	2				4				4										19
Total																									100

Assessment Questions

Remember

1. Explain the term nano
2. List three types of classifications of nanomaterials.
3. Recall the principle behind lithography.
4. Define top-down and bottom-up approach.
5. Name two types of nanoarchitecture
6. Define nanocomposites.

7. Recall the principle of electron microscopy.
8. List 5 characterization techniques in nanotechnology.
9. Define quantum well and quantum wire.
10. Write the allotropy of carbon.

Understand

1. Explain the effect of nanometer length scale.
2. Can affect the system total energy when particle size reduced? Justify.
3. Explain plasma enhanced CVD.
4. Identify the difference between self-assembly and self-organization.
5. Name 3 synthesis process under bottom-up approach.
6. Explain contact mode in AFM.
7. Is it possible to explain the entire details of the sample by taking one characterization technique? if no, justify.

Apply

1. Find three day to day live commercial application of nanotechnology?
2. Choose two template methods used to obtain nanowire or nanorods.
3. Construct the experimental setup for organic LED.
4. Find 4 industrial applications of CNT.

Analyse

1. Differentiate between bulk and nanomaterials.
2. Identify the roll of nanoparticles in biological field.
3. Distinguish between glow discharge and RF sputtering.
4. Criticize the future challenges for nanotechnology?

Evaluate

1. Nanomaterials, do they exist in nature? If yes, Identify the nanomaterials and recognize.

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15GE0P2 SEMICONDUCTOR PHYSICS AND DEVICES

3 0 0 3

Course Objectives

- Impart knowledge in physical properties of semiconducting materials
- Analyze the factors affecting the operation of semiconductor devices
- Apply the physics of semiconductors to develop semiconductor devices

Programme Outcomes (POs)
Course Outcomes (COs)

1. Exemplify the drift and diffusion current densities due to carrier transport in semiconductors
2. Analyze the electric field and space charge width of PN junction under different biasing
3. Explain the charge flow, temperature effects, turn on and turn off transients in PN junction diode
4. Illustrate the operation of Bipolar Junction transistor at different modes and different configurations.
5. Represent the working mechanism of opto-electronic devices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		1	2											
3	1	2												
4	2	1												
5	1	1												

UNIT I **9 Hours**

CARRIER TRANSPORT IN SEMICONDUCTORS

Carrier drift - drift current density - mobility effects on carrier density - conductivity in semiconductor - carrier transport by diffusion - diffusion current density - total current density - breakdown phenomena - avalanche breakdown.

UNIT II **9 Hours**

PHYSICS OF P-N JUNCTION

Basic structure-Built in potential barrier, Electric field and space charge width of P-N junction under zero, forward and reverse bias- Diffusion capacitance - one sided and linearly graded junctions.

UNIT III **9 Hours**

P-N JUNCTION DIODE

Qualitative description of charge flow in p-n junction - boundary condition - minority carrier distribution - ideal p-n junction current - temperature effects - applications - the turn on transient and turn off transient.

9 Hours

UNIT IV

BIPOLAR JUNCTION TRANSISTOR

Introduction to basic principle of operation - the modes of operation - amplification - minority carrier distribution in forward active mode - non-ideal effects - base with modulation - high injection emitter band gap narrowing - current clouding - breakdown voltage - voltage in open emitter configuration and open base configuration.

UNIT V **9 Hours**

OPTO ELECTRONIC DEVICES

Optical absorption in a semiconductor, photon absorption coefficient - electron hole pair generation - solar cell - homo junction and hetero junction - Photo transistor - laser diode, the optical cavity, optical absorption, loss and gain - threshold current.

FOR FURTHER READING

Organic semiconductors- diodes - transistors-working and applications

Total: 45 Hours

Reference(s)

1. Donald A Neamen, Semiconductor Physics and Devices, Tata McGraw Hill, 2012.
2. S. M. Sze and M. K. Lee, Semiconductor Devices, Physics and Technology, John-Wiley & Sons, 2015.
3. Ben. G. Streetman and S. K. Banerjee , Solid State Electronic Devices, Pearson Education Ltd, 2015.
4. C. Kittel, Introduction to Solid State Physics, John-Wiley & Sons, 2012.
5. J. Millman and C. Halkias, Electronic Devices and Circuits, Tata McGraw Hill, 2010.
6. Hagen Klauk, Organic Electronics: Materials, Manufacturing and Applications, Wiley-VCH, 2006.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1	3	4	4		2					2				3					2						20
2	2	3	4		4	4				3				4											24
3	2	4	2		2	2					4			4											20
4		2			2	4				2				4					4						18
5	2	4				2	2				4				4										18
Total																									100

Assessment Questions

Remember

1. Define drift current density
2. Recall diffusion capacitance
3. Write the ideal diode equation
4. List the three modes of transistor operation
5. State the principle of solar cell

Understand

1. Identify the two scattering mechanisms that affect mobility of charge carriers in semiconductors
2. Sketch the energy band diagram of a P-N junction under thermal equilibrium
3. Exemplify the boundary conditions used to calculate minority carrier distribution in a junction diode
4. Explain the base width modulation occur in transistors
5. Illustrate the working mechanism of a phototransistor

Apply

1. By applying the concept of scattering, explain the mobility of holes in a semiconductor.
2. Apply Poission equation to space charge region and hence derive the electric field under zero bias
3. Show that the minority carrier concentrations in a diode decay exponentially with distance away from the junction to their thermal-equilibrium values.
4. Derive an expression for excess minority current in the emitter region under forward action mode by applying the ambipolar transport equation.
5. Show that the minority carrier concentrations in a diode decay exponentially with distance away from the junction to their thermal-equilibrium values.

Analyse

1. Differentiate drift current and diffusion current
2. Space charge width increases upon reverse bias. Justify
3. Silicon is preferred over germanium for the manufacture of semiconductor devices. Justify
4. Compare emitter bandgap narrowing and current crowding.
5. Differentiate homojunction and heterojunction laser

Evaluation Pattern

Periodical II / PT2 50 Periodical I / PT1 50 Optional / OPT 50	30
Open book test / OBT 10	10
Library - Seminars / Assignment II / LAII 10 Library - Seminars / Assignment I / LAI 10	10

15GE0XA HEALTH AND FITNESS 1 0 0 1

Course Objectives

- To understand the fundamental concepts about physical fitness & its types, training and assessment of physical fitness

Programme Outcomes (POs)
Course Outcomes (COs)

1. Acquire the knowledge and training of the individual physical, mental and social concepts
2. Understand the fundamental concepts of yogic practice and physical fitness
3. To acquire the knowledge about nutrition and health consciousness

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1							1	2						
2							1	2						
3								3						

UNIT I **5 Hours**

FITNESS

Meaning & Definition ÃƒÂ¢?? Need & importance of Physical fitness ÃƒÂ¢?? Types Physical fitness - Exercise, Training and Conditioning and it is important

UNIT II **5 Hours**

YOGA AND MEDITATION

Meaning and definition Ãƒ??Ãƒ?Ã‚¢?? Principles of practicing Ãƒ??Ãƒ?Ã‚¢?? Basic Asana and it important Ãƒ??Ãƒ?Ã‚¢?? Pranayama and Meditation - Relaxation Techniques

UNIT III **5 Hours**

NUTRITION AND BALANCE DIET

Nutrition and Balance Diet: Needs and Important ÃƒÂ¢?? Significant of Nutritional Food - Tips for balance diet. Common Diseases for IT professionals: Common diseases - cause ÃƒÂ¢?? prevention ÃƒÂ¢?? First aid for common sports injuries.

Total: 15 Hours

Reference(s)

1. Anderson, Bob., Pearl, Bill.,&Burke, Edmund R., (2001). Getting in Shape Workout Programs for Men&Women. Mumbai: Jaico Publishing House
2. Baechle, Thomas. R, & Earle, Roger. W., (2000). Essentials of Strength Training and Conditioning. Champaign: Human Kinetics
3. Iyengar, BKS., (2003). The Art of Yoga. New Delhi: Harper Collins Publishers
4. Singh, Hardayal, (1995). Science of Sports training. New Delhi: D.V.S. Publications
5. Begum, Raheena. M., (2002). A Textbook of Foods, Nutrition and Dietetics. New Delhi: Sterling Publishers Private Limited

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15GE0XB FOUNDATION COURSE IN COMMUNITY RADIO TECHNOLOGY

1 0 0 1

Course Objectives

- The course focuses on community radio technology and various program productions techniques for radio broadcasting
- provide solutions for real world applications

Programme Outcomes (POs)

Course Outcomes (COs)

1. Understand the hardware required for field recording and setting up a studio and carry out studio and field recording
2. Examine the available options for telephony interfaces for radio
3. Demonstrate proper techniques of wiring, fixing of connectors, soldering and use of tools and equipment for studio work

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2	3											
2		1	2											
3			3											

UNIT I **3 Hours**

INTRODUCTION TO COMMUNITY RADIO

Evolution of Community Radio (CR) in India- principles behind setting up of CR- policy guidelines and their impact on technology and content of a CR station- fundamental principles behind deciding the technology for a CR station.

UNIT II **3 Hours**

STUDIO TECHNOLOGY

Properties and components of sound-difference between analogue and digital audio-hardware required for field recording and setting up a studio-fundamental principles for setting up an audio studio

UNIT III **3 Hours**

AUDIO PRODUCTION

Concept of recording and storing audio-hardware related to audio recording-open source software solutions for audio production- telephony interfaces for radio- audio Post Production

UNIT IV **3 Hours**

STUDIO OPERATIONS

Wiring, fixing of connectors, soldering and use of tools and equipment- preventive and corrective maintenance of studio and equipment.

UNIT V **3 Hours**

RADIO TRANSMISSION TECHNOLOGY

Components of the FM transmission chain- FM transmitter-different types of FM antenna - coaxial cable- propagation and coverage of RF signals-FM transmitter setup

UNIT VI **2 Hours**

MODULARITY AND CODE REUSABILITY

FUNCTIONS

Defining a function - Calling a function - Pass by reference - Function arguments - return - statements - Scope of variables - Recursion - Import statement - from...import statement - from...import * statement

UNIT VII **4 Hours**

ADVANCED CONCEPTS

File Handling Operations

Opening and closing files - Reading and writing files - Renaming and deleting files - Directories in Python

Handling Runtime Errors - Exception Handling

Exceptions - Handling exceptions - Raising exceptions - user-defined exceptions

Object Oriented Programming in Python - Classes and Objects - Methods - Principles of Object Orientation - Inheritance - Polymorphism - Encapsulation

Total: 21 Hours

Reference(s)

1. UNESCO (2001). Community Radio Handbook
2. Vinod Pavarala, Kanchan K Malik, ÃƒÂ¢??Other Voices: The Struggle for Community Radio in IndiaÃƒÂ¢??, SAGE Publications India,2007
3. Steve Buckley, Mark Raboy, Toby Mendel, Kreszentia Duer, Monroe E. Price, SeÃƒÂ¡n Ã? SiochrÃƒÂº, Ã¢??Broadcasting, Voice, and Accountability: A Public Interest Approach to Policy, Law, and RegulationÃ¢??, University of Michigan Press, 2008
4. www.floridasound.com
5. www.mediacollege.com
6. www.procosound.com

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
6																									0
7																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15GE0XC VEDIC MATHEMATICS 1 0 0 1

Course Objectives

- To improve their calculation speed, analytical thinking and numerical skills

Programme Outcomes (POs)
Course Outcomes (COs)

1. Solve problems creatively in mathematics and its applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1											

UNIT I **15 Hours**

VEDIC MATHEMATICS

Addition- Subtraction- System of Multiplication- Squaring numbers- Cube roots- Square roots- Solution of simultaneous equations- Solutions of Quadratic equations

Total: 15 Hours

Reference(s)

1. Dhaval Bathia, Vedic Mathematics, JAICO Publishing House, 29th Edition, Mumbai, 2014
2. Jagadguru Swami Sri Bharathi Krsna Tirthaji Maharaja, Vedic Mathematics, Motilal Banarsidass Publishers Private Limited, New Delhi, 1997

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
Total																									0

Assessment Questions
Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15GE0XD INTRODUCTION TO ALGORITHMS 1 0 0 1

Course Objectives

- Analyze the asymptotic performance of algorithms, Divide and conquer and Dynamic Problems
- Use Sorting and Searching algorithms for arranging the data
- Apply important algorithmic techniques to solve the real world Problem

Programme Outcomes (POs)
Course Outcomes (COs)

1. Apply Divide and conquer and Dynamic Programming Algorithm techniques to Provide the solutions for simple Problems
2. Design algorithms for Performing Sorting and Searching of data
3. Construct the Graph, Heap and BST for the given Data information

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1											
2	2	2												
3	2		3											

UNIT I **15 Hours**

INTRODUCTION TO ALGORITHMS

Algorithm Design Techniques: Divide and Conquer, Dynamic Programming, Sorting and Searching, Basic graph algorithms Ã¢??Simple Data Structures: Heaps, Balanced Search Trees

Total: 15 Hours

Reference(s)

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 2015
2. Thomas H. Cormen. Charles E. Leiserson. Ronald L. Rivest. Clifford Stein, Introduction to Algorithms, Second Edition, MIT Press, 2014
3. J.P.Tremblay and P.G.Sorenson, An Introduction to Data Structures with Application II Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2008

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
Total																									0

Assessment Questions
Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15GE0XE ETYMOLOGY 1 0 0 1

Course Objectives

- To increase vocabulary and enhance use, knowledge, and understanding of the English language
- To stimulate an appreciation for the English language, including how it developed, how new wordsenter the language, and how it continues to be dynamic
- To demonstrate the importance of a broad-based vocabulary for effective oral and written communication

Programme Outcomes (POs)
Course Outcomes (COs)

1. Examine prefixes, roots, and suffixes of Latin, Greek, Germanic, and Anglo-Saxon origin.
2. Explore the historical aspects of language, including the infusion of Indo-European languages, semantic changes, and the influence of world events

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3				2									
2		2			3									

UNIT I **7 Hours**

CONVENTIONS

Acronyms Ã¢?? Abbreviations Ã¢?? Initialisms Ã¢?? Jargon Ã¢?? Neologisms - Idiomatic Expressions Ã¢?? Euphemisms Ã¢?? Spoonerisms Ã¢?? Malapropisms Ã¢?? Mondegreens - Words Derived from Latin - Words Derived from Greek - Words Derived from - Germanic/Anglo-Saxon - Abstract word Acronym - Affix Analogy - Antonym Ã¢?? Apheresis - Blend word Assimilation - Colloquial language Clipped word

UNIT II **8 Hours**

WORD ANALYSIS

Concrete word Derivative - Dialect Diminutive suffix - Dissimilation Doublet - Etymology Euphemism - Figurative word Homonym - Hybrid word Inflection - Informal language Infusion - Jargon Linguistics - Loan words Metathesis Ã¢?? Modify - Philology Onomatopoeia - Romance language Prefix - Semantics - Root-base word - Suffix Slang - Word component Synonym

Total: 15 Hours

Reference(s)

1. Norman, Lewis. Word Power Made Easy,Goyal Publisher. Edition 2.2014.
2. C T Onions. The Oxford Dictionary of English Etymology.Volume 11, Issue 1.70, Wynford Drive, Don Mills, Ont.Oxford University Press.1965.
3. Nurnberg W, Maxwell and Rosenblum, Morris, How to build a better Vocabulary, Completely Revised and Updated, Popular Library.1961

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15GE0XF HINDUSTANI MUSIC 1 0 0 1

Course Objectives

- To have an awareness on aesthetic and therapeutic aspects of Hindustani music
- To identify and differentiate the various styles and nuances of Hindustani music
- To apply the knowledge accumulated throughout the duration of the course by way of improvisation, composition and presentation

Programme Outcomes (POs)
Course Outcomes (COs)

1. Have Basic knowledge of aesthetic and therapeutic value of Hindustani Music

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			2											

UNIT I **10 Hours**

AESTHETICS

Introduction to music - Aesthetics of Hindustani Music - Classification (Raga, instruments, style as per the presentation and the gharaanaas) - Folk music, Dhamaar, Dhrupad

UNIT II **10 Hours**

COMPOSITION AND THERAPEUTIC VALUE

Taal and Raga - Bandeesh, Taraanaa Ã¢?? Madhya and drut laya, Vilambit khyaal as demonstration - Therapeutic benefits of Hindustani music - Stage performance

Total: 20 Hours

Reference(s)

1. Devdhar B.R., Raga bodh (Part 1 & 2), Devdhar School of Indian Music, Mumbai, 2012.
2. Vasant, Sangeet Vishaarad , Hathras, Uttar Pradesh, 2015
3. raag-hindustani.com/
4. play.raaga.com/Hindustani
5. raag-hindustani.com/Scales3.html
6. www.poshmaal.com/ragas.html

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
Total																									0

Assessment Questions
Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15GE0XG CONCEPT, METHODOLOGY AND APPLICATIONS OF VERMICOMPOSTING

1 0 0 1

Course Objectives

- To understand the importance of safe methods of treating solid wastes generated through various human activities
- To appreciate the skills / devices / practices associated with the compact proceedures of biodegradation of unwanted solid residues

Programme Outcomes (POs)
Course Outcomes (COs)

1. Understand the role of recycling of garbage leading to the sustenance of our health and environment.
2. Recognize the organic farming practices and production of healthy food products.
3. Prepare and maintain tips for small scale compost units and thereby becoming more environmentally conscious

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		1												
3		2												

UNIT I **15 Hours**

VERMICOMPOSTING TECHNOLOGY

Ecological roles and economic importance of earthworms - need for earthworm culture Ã¢?? scope and importance of vermiculture Ã¢?? limiting factors - types of worm culturing and the relative benefits Ã¢?? Small scale and commercial methods: process & advantages Ã¢?? Vermicomposting equipments, devices Ã¢?? Design and maintenance of vermi bed - Products from vermiculture (matter & humus cycle) Ã¢?? vermicastings in organic farming/horticulture - Marketing the products of vermiculture Ã¢?? quality control, market research, marketing techniques Ã¢?? Applied vermiculture: use of urban solids & farm/ industrial residues for vermicomposting - Constraints of vermiculture and its future perspectives Ã¢?? Artificial Earthworm as a standalone biodegradation assembly.

Total: 15 Hours

Reference(s)

1. Sultan Ahmed Ismail, 2005. The Earthworm Book, Second Revised Edition. Other India Press, Goa, India.4
2. Vermiculture Technology; Earthworms, Organic Wastes and Environmental Management, 2011, Edited by Clive A Edwards, Norman Q Arancon & Rhonda Sherman, CRC Press
3. www.organicgrowingwithworms.com.au
4. New York Times Ã¢?? Scientists Hope to Cultivate and Immune System for Crops

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
Total																									0

Assessment Questions
Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15GE0XH AGRICULTURE FOR ENGINEERS 1 0 0 1

Course Objectives

- To impart the basic knowledge of agricultural and horticultural crops, cropping systems
- To study the weed and nutrient management, irrigation water requirement and its quality

Programme Outcomes (POs)

Course Outcomes (COs)

1. Understand the science of Agriculture
2. Summarize and apply the methodologies needed in agriculture based on the field conditions.
3. Develop enough confidence to identify the crop patterns in real world and offer appropriate solutions

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2	3											
2		2	3											
3			2											

UNIT I **5 Hours**

AGRONOMICAL PRACTICES AND CROPS

Definition and scope of agronomy , Classification of Crops, agricultural and horticultural crops Effect of Different Weather Parameters on Crop Growth and Development , Principal of Tillage, Tilth and Its Characteristics, Role of Water in Plant and Its Absorption, Conduction and Transpiration of Water and Plant Processes, Soil Water Extraction Pattern and Plant Response. Introduction to weeds, Weeds Control.

UNIT II **5 Hours**

CROP ROTATION, CROPPING SYSTEMS, RELAY AND MIXED CROPPING

Crop Rotation, Different Cropping Systems Ã¢?? I, Different Cropping Systems Ã¢?? II, Scope of Horticultural Crops, Soil Requirement for Fruits, Vegetables and Flowers Crops, Climatic Requirement for Fruits, Vegetables and Flowers Crops.

UNIT III **5 Hours**

PLANT NUTRIENTS

Essential Plant Nutrients, Nutrient Deficiency, Toxicity and Control Measures. Chemical fertilizers, fertilizer Reaction in Soil and Use Efficiency

UNIT IV **5 Hours**

QUALITY OF IRRIGATION WATER AND IRRIGATION METHODS

Quality of Irrigation Water, Poor Quality of Irrigation Water and Management Practices. Surface Irrigation methods, and micro irrigation methods

Total: 20 Hours

Reference(s)

1. SP. Palaniappan, and S. Sivaraman, Cropping systems in the tropics- Principles and Management, New Age international publishers, New Delhi, (2nd edition), 1998.
2. S.Sankaran and V.T Subbaiah Mudaliar, Principles of Agronomy, The Bangalore Printing and Pubg Co, Bangalore, 1993.

3. P.Balasubramain and SP. Palniappan, Principles and Practices of Agronomy, Agrobios publishers, Ludhiana, 2001.
4. T.Yellamanda Reddy and G.H. Sankara Reddi, Principles of Agronomy, Kalyani publishers, Ludhiana, 2005
5. B.Chandrasekaran, B. , K. Annadurai and E. Somasundaram, A Text book of Agronomy, Scientific publishers, Jodhpur, 2007
6. George Acquaah, Horticulture-principles and practices, Prentice-Half of India Pvt. Ltd., New Delhi, 2002.

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15GE0XI INTRODUCTION TO DATA ANALYSIS USING SOFTWARE

1 0 0 1

Course Objectives

- To familiarize students on the features of MS Excel
- To enable the students to use Excel in the area of critical evaluation.
- To Facilitate the student to construct graphs

Programme Outcomes (POs)
Course Outcomes (COs)

1. Create versatile Excel document.
2. Apply built in functions for data analysis.
3. Prepare dynamic Charts

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		3											
2		2	2											
3			3											

UNIT I **4 Hours**

EXCEL FUNDAMENTALS AND EDITING

Starting and Navigating a WorksheetÃ¢?? Entering Information Ã¢?? Hyperlinks Ã¢?? Saving Ã¢?? Editing Techniques Ã¢?? Entering a Series of Labels, Numbers and Dates Ã¢?? Checking Errors.

UNIT II **4 Hours**

FORMATTING

Formatting Cells Ã¢?? Changing Column Widths and Row Heights Ã¢?? Creating Conditional Formatting Ã¢?? Using Styles Ã¢?? Creating and Modifying Templates Ã¢?? Changing Page Breaks.

UNIT III **4 Hours**

POWER ORGANIZING AND CUSTOMIZING EXCEL

Managing Worksheets Ã¢?? Referencing Cells in Other Worksheets Ã¢?? Using More than One Work Book Ã¢?? Managing Shared Work Books Ã¢?? Protecting Worksheets and Workbooks. Adjusting Views Ã¢?? Setting Printing Options Ã¢?? Using Multiple Panes Ã¢?? Customizing Excel Using the Options Dialog Box.

UNIT IV **5 Hours**

CRUNCHING NUMBERS

Building a Formula Ã¢?? Using Basic Built-in Functions Ã¢?? Using Functions to Analyze Data Ã¢?? Using Names in Functions Ã¢?? Array Functions

UNIT V **3 Hours**

WORK SHEET CHARTS

Planning a Chart Ã¢?? Creating Chart Ã¢?? Formatting a Chart Ã¢?? Adding Labels and Arrows

Total: 20 Hours

Reference(s)

1. Michael J. Young, Michael Halvorson, Ã¢??Office System 2007 EditionÃ¢??, Prentice-Hall of India (P) Ltd., New Delhi, 2007
2. Curtis D. Frye, Microsoft Office Excel 2007 Step by Step, Microsoft Press, 2007
3. Mark Dodgeand Craig Stinson, Ã¢??Microsoft Office Excel 2007 Inside OutÃ¢??, Microsoft Press, 2007

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20

15GE0XJ ANALYSIS USING PIVOT TABLE 1 0 0 1

Course Objectives

- To familiarize students on the features of Pivot Table.
- To enable the students to use Pivot Table in the area of data analysis.
- Facilitate the student to construct the charts for visualization of data

Programme Outcomes (POs)
Course Outcomes (COs)

1. Able to construct the Pivot Table and Group, Sort, Filter the Data to do the analysis.
2. Able to do the Calculation with in Pivot Table for advance analysis.
3. Capable of Constructing Pivot Charts to make visual presentation

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2		1												
3		3	2											

UNIT I **4 Hours**

PIVOT TABLE FUNDAMENTALS

Introduction about Pivot Table, Why and When to use the Pivot Table, Anatomy of the Pivot Table, Limitations, Preparing the Source Data, Creating the Pivot Table.

UNIT II **4 Hours**

GROUPING PIVOT TABLE DATA

Grouping the Items in a Report Filter, Grouping Text Items, Grouping Dates by Month, Grouping Dates Using the Starting Date, Grouping Dates by Fiscal Quarter, Grouping Dates by Week, Grouping Dates by Months and Weeks, Grouping Dates in One Pivot Table Affects Another Pivot Table, Grouping Dates Outside the Range.

UNIT III **4 Hours**

SORTING AND FILTERING PIVOT TABLE DATA

Sorting a Pivot Field: Sorting Value Items, Sorting Text Items, Sorting Items in a Custom Order. Filtering a Pivot Field: Manual Filter, Label Filter, Value Filter, Multiple Filters

UNIT IV **5 Hours**

CALCULATIONS WITHIN THE PIVOT TABLES

Using Formulae: Creating a Calculated Field with and without Ã¢??IF Condition, Calculated Item, Using Custom Calculations: % of Column, % of Row, % of Total, % Of, Running Total, Difference From, % Difference From, Index

UNIT V **3 Hours**

PIVOT CHARTS

Creating a Normal Chart from Pivot Table Data, Filtering the Pivot Chart, Changing the Series Order, Changing Pivot Chart Layout Affects Pivot Table, Changing Number Format in Pivot Table Affects

Pivot Chart, Converting a Pivot Chart to a Static Chart, Refreshing the Pivot Chart, Creating Multiple Series for Years

Total: 20 Hours

Reference(s)

1. Debra Dalgleish, Ã¢??Excel 2007 - PivotTables Recipes A Problem-Solution ApproachÃ¢??, Apress, 2007, (ISBN-13 (pbk): 978-1-59059-920-4)
2. Bill Felen and Michael Alexander, Ã¢??Pivot Table Data Crunching for Microsoft Office 2007Ã¢??, Pearson Education, Inc., QUE Series.
3. Wayne L. Winston, Ã¢??Microsoft Office Excel 2007: Data Analysis and Business ModelingÃ¢??, Microsoft Press, 2007
4. John Walkenbach, Ã¢??Microsoft Office Excel 2007Ã¢??, Wiley Publishing, Inc. 2007
5. Mark Dodgeand Craig Stinson, Ã¢??Microsoft Office Excel 2007 Inside OutÃ¢??, Microsoft Press, 2007
6. Curtis D. Frye, Microsoft Office Excel 2007 Step by Step, Microsoft Press, 2007

Assessment Pattern

Unit/RBT	Remember				Understand				Apply				Analyse				Evaluate				Create				Total
	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	F	C	P	M	
1																									0
2																									0
3																									0
4																									0
5																									0
Total																									0

Assessment Questions

Evaluation Pattern

Test / Test 50	30
Quiz / Quiz 20	20