M.E. (Computer Science and Engineering)

2018 Regulations, Curriculum & Syllabi

BANNARI AMMAN INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai
Approved by AICTE - Accredited by NAAC with 'A' Grade)
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REGULATIONS 2018

(CHOICE BASED CREDIT SYSTEM)

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

NOTE: *The regulations given hereunder are subject to amendments as may be decided by the Academic Council of the Institute 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. ELIGIBILITY FOR ADMISSION

(i) Candidates seeking admission to the First Semester of M. E. / M. Tech. degree programmes will be required to satisfy the eligibility criteria for admission thereto prescribed by the Directorate of Technical Education, Chennai and Anna University, Chennai.

(ii) Part - time candidates should satisfy conditions regarding experience, sponsorship, place of work and other requirements that may be prescribed by the Directorate of Technical Education, Chennai and Anna University, Chennai from time to time, in addition to satisfying requirements as in Clause 1 (i).

2. DURATION OF THE PROGRAMME

(i) **Minimum Duration:** Master of Engineering (M.E.) / Master of Technology (M.Tech.) extends over a period of two years. The two academic years (Part-time three academic years) will be divided into four semesters (Part-time six Semesters) with two semesters per year.

(ii) **Maximum Duration**: A candidate shall complete all the passing requirements of M. E. / M. Tech. programmes within a maximum period of 4 years / 8 semesters in case of full-time programme and 6 years / 12 semesters in case of part-time programme, these periods being reckoned from the commencement of the First semester to which the candidate was first admitted, regardless to the break-of-study availed.

3. BRANCHES OF STUDY

Following M.E. / M.Tech. Programmes are offered by the Institute

M.E. Programmes

1. Applied Electronics
2. CAD/CAM
3. Communication Systems
4. Computer Science and Engineering
5. Embedded Systems
6. Engineering Design
7. Industrial Automation and Robotics
8. Industrial Safety Engineering
9. Instrumentation Engineering
10. Power Electronics and Drives
11. Software Engineering
12. Structural Engineering

13. VLSI Design

M. Tech. Programme

14. Biotechnology

4. STRUCTURE OF PROGRAMMES

(i) **Curriculum:** Every Post Graduate Programme will have a curriculum with syllabi consisting of theory and practical courses that include **Professional Core** (core courses relevant to the chosen specialization), **Professional Electives** (elective courses) and **Employability Enhancement Courses** (Practical courses, Project Work, Internship, Miniproject and Industrial / Practical Training).

(ii) **Project Work:** Every student, individually, shall undertake Dissertation Phase - I during the third semester (fifth semester for part-time programme) and Dissertation Phase - II during the fourth semester (Sixth semester for part-time programme) under the supervision of a qualified faculty (faculty members with Ph.D. or P.G. with a minimum of 3 years of teaching experience). The Dissertation Phase - II shall be a continuation work of the Dissertation Phase - I. The project work can be undertaken in an industrial / research organization or Institute in consultation with the faculty guide and the Head of the Department. In case of project work at industrial / research organization, the same shall be jointly supervised by a faculty guide and an expert from the organization.

(iii) **Elective Courses: Seven Elective** courses are offered to the students admitted in various disciplines as prescribed in the curriculum to widen their knowledge in their specialization area.

(iv) **Online Courses:** A Student may be permitted to credit online courses with the approval of a 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 agenc y shall be presented to the Academic Council for information and further suggestions. However, the student needs to obtain certification from the agency offering the course to become eligible for writing or seeking exemption from the End Semester Examination. In case of credits earned through online mode from the 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.

(v) **Industrial Training:** Every full-time student shall take-up training in the industry / research laboratories, under the supervision of a faculty guide during summer / winter vacation till pre-final semester of the programme subject to the evaluation prescribed in the Clause 15. Credits of such courses will be indicated for the course in the Grade Sheet if the student passes, but it will not be considered for computing CGPA.

(vi) **Mini Project**: A Mini Project shall be undertaken by the students individually in consultation with the respective faculty and Head of the Department, as specified in the curriculum. A student is expected to make a presentation about the mini-project during the final evaluation as given in the Clause 15.

(vii) **Value Added / Certificate Courses:** Students can opt for any one of the Value added Courses in II and III semester, approved by the Academic Council. A separate Certificate will be issued on successful completion of the Course by the Controller of Examinations.

(viii) **Credit Assignment:** Each course is normally assigned a certain number of credits with 1 credit per lecture hour per week, 1 credit for 2 hours of practical per week, 1 credit for 1 hours of tutorial per week, The exact numbers of credits assigned to the different courses of various programmes are decided by the respective Boards of Studies.

(ix) **Minimum Credits:** For the award of the degree, the student shall earn a minimum number of total credits as prescribed by the respective Board of Studies as given below:

S.No.	**M.E./M. Tech. Programmes**	**Total Credits**
1.	M.E. Applied Electronics	69
2.	M.E. CAD / CAM	70
3.	M.E. Communication Systems	70
4.	M.E. Computer Science and Engineering	70
5.	M.E. Embedded Systems	70
6.	M.E. Engineering Design	70
7.	M.E. Power Electronics and Drives	69
8.	M.E. Software Engineering	70
9.	M.E. Structural Engineering	69
10.	M.E. VLSI Design	70
11.	M.E. Industrial Safety Engineering	70
12.	M.E. Industrial Automation and Robotics	69
13.	M.E. Instrumentation Engineering	69
14.	M.Tech. Biotechnology	69

5. COURSE ENROLLMENT AND REGISTRATION

5.1 Each student, on admission shall be assigned to a Faculty Advisor (vide Clause 7) who shall advise / counsel the student about the details of the academic programme and the choice of courses considering the student's academic background and career objectives.

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

5.3 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.

5.3.1 Each student on admission to the programme shall register for all the **courses prescribed in the curriculum** in the **first Semester of study**.

5.3.2 The enrolment 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 enrolment by registering for the courses within the first five working days after the commencement of the Semester II.

5.3.3 If a student wishes, the student may drop or add courses (vide Clause 5.5) within **five** working days after the commencement of the semester concerned and complete the registration process duly authorized by the PG coordinator of the programme. In the case, if a student fails in a course, he / she may be permitted to register the course in the subsequent semester or when it is offered.

5.3.4 A student who has passed all the courses prescribed in the curriculum for the award of the degree shall not be permitted to re-enroll to improve the student's marks in a course or the aggregate marks / CGPA.

5.4 Minimum Credits to Register for Project work

The Project work for M.E. / M.Tech. consists of Dissertation Phase - I and Dissertation Phase - II. The Dissertation Phase - I is to be undertaken during III semester (V semester for part-time programme) and Dissertation Phase - II, which is a continuation of Phase – I is to be undertaken during IV semester (VI semester for part-time programme). Minimum 24 credits are required to be earned to enroll the Dissertation Phase - I.

If a student fails to earn the requisite minimum credits, the student cannot enroll for the Dissertation Phase - I. In such a case, the student can enroll for the project work in a subsequent semester, after earning the minimum credits specified.

5.5 Flexibility to Add or Drop courses

5.5.1 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 of the student's programme by opting for additional courses.

5.5.2 From the II to final semesters, 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 such cases, the attendance requirement as stated Clause 6 is mandatory.

5.6 Reappearance Registration

5.6.1 If a student fails in a theory course, the student shall do reappearance registration for that course in the subsequent semester or when it is offered next.

5.6.2 On registration, a student may attend the classes for the reappearance registration courses, if the student wishes. However, the attendance requirement (vide Clause 6) is not compulsory for such courses.

5.6.3 The student who fails in any practical / Miniproject or any other EEC courses shall register for the same in the subsequent semester or when offered next, and **repeat** the course. In this case, the student shall attend the classes, satisfy the attendance requirements (vide Clause 6) and earn Continuous Assessment marks.

5.6.4 The student who fails in Dissertation Phase I / II shall register for the same in the subsequent semester or when offered next, and **repeat** the course. In this case, the student shall attend the classes, satisfy the attendance requirements (vide Clause 6), earn Continuous Assessment marks and appear for the End Semester Examinations. Reappearance Registration is not available for such courses.

5.6.5 If a student is prevented from writing the end semester examination of a course due to lack of attendance, the student has to register for that course again, when offered next, attend the classes and fulfil the attendance requirements as per Clause 6.

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

A student who has fulfilled the following conditions (vide clause 6.1 and 6.2) shall be deemed to have satisfied the attendance requirements for appearing for End Semester Examination of a particular course.

Each semester shall normally consist of 75 working days or 540 periods of each 50 minutes duration, for full-time mode of study or 250 periods for part-time mode of study.

6.1 Ideally 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.

6.2 If a student secures attendance between 70% and 79% in any course 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. Such certificates shall be forwarded to the Controller of Examinations for verification and for the permission to attend the examinations.

6.3 A student shall normally be permitted to appear for End Semester Examination of a course if the student has satisfied the attendance requirements (vide Clause 6.1 –

6.2) and has registered for examination in those courses of that semester by paying the prescribed fee.

6.4 A Student who does not satisfy clause 6.1 and 6.2 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 5.6.4).

6.5 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 / marks.

7. 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.

8. COMMITTEES

8.1 Class Committee Meeting

(i) For all the courses taught, prescribed in the curriculum, Class Committee meeting shall be convened twice in a semester, comprising members of the faculty handling all the courses and two student representatives from the class.

(ii) One of the members of the faculty (not handling any courses to that class), nominated by the Head of the Department, shall coordinate the activities of this 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.

9. ASSESSMENT AND PASSING REQUIREMENTS

9.1 Assessment

The assessment will comprise Continuous Assessment and End Semester Examination, carrying marks as specified in the scheme (Clause 15). All assessments will be done on absolute marks basis. However, for the purpose of reporting the performance of a student, Letter Grades and Grade Points will be awarded as per Clause 9.4.

9.2 End Semester Examinations

End Semester Examinations will normally be conducted as per the time table circulated by the Office of the Controller of Examination. A student will be permitted to appear for the End Semester Examination of a semester only if he/she

completes the study of that semester satisfying the requirements given in Clause 5 and 6, and registers simultaneously for the examinations of the highest semester eligible and the courses, pertaining to that semester, that need reappearance.

9.3 Employability Enhancement Courses

Every candidate shall submit reports on Industrial training / Mini-project, Dissertation - Phase I and Dissertation - Phase II on dates announced by the Institute / Department through the faculty guide to the Head of the Department. If a candidate fails to submit the reports of any of these courses not later than the specified date, he/she is deemed to have failed in it. The reports /papers shall be orally presented by the student before a team of expert consisting of an internal examiner, usually the supervisor, and an external examiner, appointed by the Head of the Institution.

A candidate is permitted to register for the Dissertation -Phase II, only after passing the Dissertation - Phase I. A candidate who fails in Industrial training / Mini-project, Dissertation - Phase I or Dissertation - Phase II shall register for redoing the same at the beginning of a subsequent semester.

9.4 Letter Grade and Grade Point: The Letter Grade and the Grade Point are awarded based on percentage of total marks secured by a candidate in an individual course as detailed below:

Range of Percentage of Total Marks	Grade Point	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)
Incomplete	**0**	I
Withdrawal	**0**	W
Absent	**0**	AB

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

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

After completion of the evaluation process, Semester Grade Point Average (SGPA) and

Cumulative Grade Point Average is calculated using the formula:

$$SGPA/CGPA = \frac{\sum_{1}^{n} C_i * g}{\sum_{1}^{n} C_i}$$

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 SGPA and all the semesters, under consideration, in the case CGPA.

9.5 A student can apply for revaluation of his / her semester examination answer paper in a theory course, within 3 working days from the declaration of results, along with prescribed application to the Controller of Examinations through the Head of Department. Revaluation is not permitted for laboratory courses, industrial training and project works.

9.6 Passing a Course

A candidate who secures Grade Point 6 or more in any course of study will be declared to have passed that course, provided, if secures a minimum of 50% of the total mark in the End Semester Examination of that course. The Continuous Assessment (CA) marks obtained by the candidate in the first appearance shall be retained and considered valid for one subsequent attempt, except Clause 5.6.3 & 5.6.4. However, from the third attempt onwards the candidate shall be declared to have passed the course if he/she secures a minimum of 6 Grade Points in the course prescribed during the End Semester Examination alone.

9.7 Besides satisfying the above Clauses, a student shall present a technical paper, based on the courses of study, in a National or an International conference before the completion of semester IV.

10. REJOINING THE PROGRAMME

A candidate who has not completed the study of any semester as per Clause 6 or who is allowed to rejoin the programme after the period of discontinuance or who on his/her own request is permitted to repeat the study of any semester (break of study), may join the semester which he /she is eligible or permitted to join, only at the time of its normal commencement for a regular batch of candidates and after obtaining the approval from the Director of Technical Education and Anna University, Chennai. In such case, earlier Continuous Assessment in the repeated courses will be disregarded. No candidate will however be allowed to enroll in more than one semester at any point of time.

11. QUALIFYING FOR THE AWARD OF THE DEGREE

A candidate will be declared to have qualified for the award of the M.E. / M.Tech. Degree provided:

(i) he/she has successfully completed the course requirements and has passed all the prescribed courses of study of the respective programme listed in Clause 3 within the duration specified in Clause 2.

(ii) No disciplinary action is pending against the candidate.

12. CLASSIFICATION OF DEGREE

12.1 First Class with Distinction:

A student who satisfies the following conditions shall be declared to have passed the examination in First class with Distinction:

M.E. / M.Tech., (Full Time)

- Should have passed the examination in all the courses of all the four semesters in the student's First Appearance within three years, which includes authorised break of study of one year. Withdrawal from examination (vide Clause 13) will not be considered as an appearance.
- Should have secured a CGPA of not less than 8.50.
- Should NOT have been prevented from writing end Semester examination due to lack of attendance in any of the courses.

M.E. / M.Tech. (Part Time)

- Should have passed the examination in all the courses of all the six semesters in the student's First Appearance within four years, which includes authorised break of study of one year. Withdrawal from examination (vide Clause 13) will not be considered as an appearance.
- Should have secured a CGPA of not less than 8.50.
- Should NOT have been prevented from writing end Semester examination due to lack of attendance in any of the courses.

12.2 First Class:

A student who satisfies the following conditions shall be declared to have passed the examination in First class:

M.E. / M.Tech. (Full Time)

- Should have passed the examination in all the courses of all four semesters within three years ,which includes one year of authorized break of study (if availed) or prevention from writing the End Semester Examination due to lack of attendance (if applicable).
- Should have secured a CGPA of not less than 6.50

M.E. / M.Tech. (Part Time)

- Should have passed the examination in all the courses of all six semesters within four years, which includes one year of authorized break of study (if availed) or prevention from writing the End Semester Examination due to lack of attendance (if applicable).
- Should have secured a CGPA of not less than 6.50

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

13. WITHDRAWAL FROM EXAMINATION

13.1 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) of only once during the entire duration of the degree programme.

13.2 Withdrawal application shall be valid only, if the student is eligible to write the examination as per Clause 6 and, if such request for withdrawal is made prior to the submission of marks of the Continuous Assessment of the course(s) with the recommendations from the Head of the Department.

13.3 Withdrawal shall not be construed as an opportunity for appearance in the examination for the eligibility of a candidate for First Class with Distinction or First Class.

14. AUTHORIZED BREAK OF STUDY FROM A PROGRAMME

14.1 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.

14.2 A student who would like to avail the break of study, on account of short term employment / Medical treatment / personal reasons) shall apply to the Head of the Institution through concerned Head of the Department, (application available with the Controller of Examinations), in any case, not later than the last date for registering for the semester.

14.3 The students permitted to rejoin the programme after break of study / prevention due to lack of attendance, shall be governed by the Curriculum and Regulations in force at the time of rejoining. A committee constituted by the Head of the Institution shall prescribe additional / equivalent courses, if any, from the regulation in-force, so as to bridge the requirement between curriculum in-force and the old curriculum.

14.4 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 the Clause 2, irrespective of the period of break of study in order that he / she may be eligible, for the award of the degree (vide Clause 11 and 12).

14.5 In case of any valid reasons for the extension of break-of-study, such extended break-of-study may be granted by the Head of the Institution for a period not more than one year in addition to the earlier authorized break of study. Such extended break-of-study shall be counted for the purpose of classification of degree (vide clause 12).

14.6 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 enrolment. Such candidates are not entitled to seek readmission under any circumstances.

15. SCHEME OF ASSESSMENT

I	THEORY COURSES	Marks
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Periodical Test I (20)	
	Periodical Test II (20)	
	Term Paper Report (5) & Presentation (5)	
	End Semester Examination	**50**
	Total Marks	**100**

II	THEORY COURSES WITH LAB COMPONENT	Marks
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Periodical Test I (15)	
	Periodical Test II (15)	
	Final Lab Examination (10)	
	Viva-voce (10)	
	End Semester Examination	**50**
	(QP pattern as per (I))	
	Total Marks	**100**

III	PRACTICAL COURSES	Marks
	Continuous Assessment	**100**
	Distribution of marks for Continuous Assessment:	
	Conduct of Experiment	
	i. Preparation (10)	
	ii. Experiment and Analysis of Results (20)	
	iii. Record (5)	
	Self-Learning Experiment (15)	
	Test - Cycle I (15)	
	Test - Cycle II (15)	
	Final Viva-voce (20)	
	Total Marks	**100**

IV	DISSERTATION PHASE - I	Marks
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Presentation I	
	Identification of topic and Justification (10)	
	Literature Survey (10)	
	Presentation II	
	Work plan & Approach (10)	
	Progress, Results and Discussion (20)	
	End Semester Examination	
	Presentation and Demonstration (20)	**50**
	Report (10)	
	Viva Voce (20)	
	Total Marks	**100**

V	**DISSERTATION PHASE - II**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Presentation I	
	Work plan & Approach (10)	
	Presentation II	
	Progress, Results and Discussion (20)	
	Journal Publication (20)	
	End Semester Examination	
	Presentation and Demonstration (20)	**50**
	Report (10)	
	Viva Voce (20)	
	Total Marks	**100**

VI	**MINI PROJECT**	**Marks**
	Continuous Assessment	**100**
	Distribution of marks for Continuous Assessment:	
	Review I (25)	
	Review II (25)	
	Report Presentation & Viva voce (50)	
	Total Marks	**100**

VII	**INDUSTRIAL TRAINING / INTERNSHIP (CONTINUOUS ASSESSMENT ONLY)**	**Marks**
	Presentation and Viva-voce I	**25**
	Presentation and Viva-voce II	**25**
	Review at the Industry	**20**
	Case study / Report	**30**
	Total Marks	**100**

VIII	**VALUE ADDED COURSES / CERTIFICATE COURSES (CONTINUOUS ASSESSMENT ONLY)**	**Marks**
	Test	50
	Final Evaluation / Test	50
	Grades (Excellent / Good / Satisfactory)	

Optional Test: *A student becomes eligible to appear for the one optional test conducted after the Periodical Test II, only under the following circumstances, if absent for Test I or Test II or both, on account of (i) medical reasons (hospitalization / accident / specific illness) (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 faculty member 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 and VIII listed above.*

16. 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.

The Question Paper Pattern (Theory Examination) for PG course is given below:

Type	**Questions**	**Marks**
Part A	2 Mark Questions (10 x 2 Marks)	20
Part B	12 Mark Questions either or pattern (5 x 12 Marks)	60
Part C	Comprehensive Type- 20 Mark Question (1 x 20 Marks)	20
	Total	100

M.E. – COMPUTER SCIENCE AND ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

I The Graduate will be able to gain knowledge in recent trends and apply cutting-edge technologies in the domain of Computer Science and Engineering

II The Graduate will be able to develop professionals required to meet the needs of the industry and research in the field of Computer Science and engineering.

III The Graduate will be able to contribute effectively as a team member/leader, to analyze and solve real-world problems

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PROGRAMME OUTCOMES (POs)

a) The Graduate will able to accomplish research /investigation and development work independently to solve practical problems.

b) The Graduate will able to write and present a substantial technical report/document

c) The Graduate will able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

d) The Graduate will able to use the techniques, skills, and modern engineering tools, including simulation and modeling for engineering needs.

e) The Graduate will able to demonstrate independent learning by adopting research pursuits.

f) The Graduate will able to possess knowledge for functioning effectively, as a member or team leader, in software projects considering multidisciplinary environments.

MAPPING OF PEOs AND POs

PEO(s)	**PROGRAMME OUTCOME(s)**					
	(a)	(b)	(c)	(d)	(e)	(f)
I			X	X		
II	X	X	X		X	
III						X

M.E: COMPUTER SCIENCE AND ENGINEERING

Minimum credits to be earned: 70

FIRST SEMESTER

Code No.	Course	Objectives & Outcomes		L	T	P	C
		PEOs	POs				
18CS11	ENGINEERING MATHEMATICS AND APPLICATIONS	I,II	c	3	0	0	3
18CS12	ADVANCED DATA STRUCTURES AND ALGORITHMS	I, II	a,c	3	0	0	3
18CS13	ADVANCED COMPUTER ARCHITECTURE	I, II	c	3	0	0	3
18CS14	ADVANCED OPERATING SYSTEMS	I,II	a,c	3	0	0	3
	ELECTIVE I			3	0	0	3
	ELECTIVE II			3	0	0	3
18CS17	DATA STRUCTURES AND ALGORITHMS LABORATORY	I, II, III	a	0	0	2	1
			Total				**19**

SECOND SEMESTER

Code No.	Course	Objectives & Outcomes		L	T	P	C
		PEOs	POs				
18CS21	ADVANCED DATABASE TECHNOLOGY	I,II	a,c	3	0	0	3
18CS22	INTERNET AND WEB TECHNOLOGY	I,II	a,c	3	0	2	4
18CS23	OBJECT ORIENTED SOFTWARE ENGINEERING	I,II,III	a,c,f	3	0	0	3
18CS24	COMPILER CONSTRUCTION AND OPTIMIZATION	I,II	c	3	0	0	3
	ELECTIVE III			3	0	0	3
	ELECTIVE IV			3	0	0	3
18CS27	DATABASE TECHNOLOGY LABORATORY	I,II	a,c	0	0	2	1
18CS28	MINIPROJECT	I,II	a,b,c,d,e,f	0	0	2	1
	AUDIT COURSE I			2	0	0	0
			Total				**21**

THIRD SEMESTER

Code No.	Course	Objectives & Outcomes		L	T	P	C
		PEOs	POs				
18CS31	DATA WAREHOUSING AND DATA MINING	I,II	a,c,e	3	0	0	3
	ELECTIVE V			3	0	0	3
	ELECTIVE VI			3	0	0	3
	ELECTIVE VII			3	0	0	3
18CS35	DISSERTATION PHASE I	I,II,III	a,b,c,d,e,f	0	0	12	6
	AUDIT COURSE II	-	-	2	0	0	0
			Total				**18**

FOURTH SEMESTER

Code No.	Course	Objectives & Outcomes		L	T	P	C
		PEOs	POs				
18CS41	DISSERTATION PHASE II	I,II,III	a,b,c,d,e,f	**0**	**0**	**24**	**12**

LIST OF CORE ELECTIVES

Code No.	Course	Objectives & Outcomes		L	T	P	C
		PEOs	POs				
18CS51	AGENT BASED INTELLIGENT SYSTEMS	I,II	a,d,e	3	0	0	3
18CS52	SOFT COMPUTING	I,II	a,d,e	3	0	0	3
18CS53	PATTERN RECOGNITION	I,II	a,d,e	3	0	0	3
18CS54	SEMANTIC WEB	I,II	a,d,e	3	0	0	3
18CS55	NATURAL LANGUAGE PROCESSING	I,II	a,d,e	3	0	0	3
18CS56	BIG DATA ANALYTICS	I,II	a,d,e	3	0	0	3
18CS57	ADVANCED COMMUNICATION NETWORKS	I,II	a,d,e	3	0	0	3
18CS58	NETWORK ENGINEERING AND MANAGEMENT	I,II	a,d,e	3	0	0	3
18CS59	MOBILE AND PERVASIVE COMPUTING	I,II	a,d,e	3	0	0	3
18CS60	ADHOC AND WIRELESS SENSOR NETWORKS	I,II	a,d,e	3	0	0	3
18CS61	CLOUD SYSTEMS AND INFRASTRUCTURES	I,II	a,d,e	3	0	0	3
18CS62	SOFTWARE ARCHITECTURE PATTERNS	I,II	a,d,e	3	0	0	3
18CS63	XML AND WEB SERVICES	I,II	a,d,e	3	0	0	3
18CS64	BIOMETRIC TECHNOLOGIES	I,II	a,d,e	3	0	0	3
18CS65	APPLIED CRYPTOGRAPHY	I,II	a,d,e	3	0	0	3
18CS66	FOUNDATION OF DATA SCIENCE	I,II	a,d,e	3	0	0	3
18CS67	CONCURRENT PROGRAMMING	I,II	a,d,e	2	0	2	3
18CS68	INTERNET OF THINGS	I,II	a,d,e	3	0	0	3
18CS69	5G NETWORKS AND APPLICATIONS	I,II	a,d,e	3	0	0	3
18CS70	RESEARCH METHODOLOGY AND IPR	II,III	a,b,e,f	3	0	0	3

LIST OF OPEN ELECTIVES

Code No.	Course	Objectives & Outcomes		L	T	P	C
		PEOs	POs				
18GE01	BUSINESS ANALYTICS	I,II,III	d,e,f	3	0	0	3
18GE02	INDUSTRIAL SAFETY	I,III	b,c,d	3	0	0	3
18GE03	OPERATIONS RESEARCH	I,III	d,e,f	3	0	0	3
18GE04	COST MANAGEMENT OF ENGINEERING PROJECTS	I,III	c,d,e	3	0	0	3
18GE05	COMPOSITE MATERIALS	I,II,III	a,b,c	3	0	0	3
18GE06	WASTE TO ENERGY	I,II,III	a,b,d	3	0	0	3

LIST OF AUDIT COURSE I

Code No.	Course	Objectives & Outcomes		L	T	P	C
		PEOs	POs				
18XE11	RESEARCH PAPER WRITING	I	c,d,e	2	0	0	0
18XE12	TRADITIONAL TECHNICAL KNOWLEDGE	I,II	b,c,d	2	0	0	0
18XE13	VALUE EDUCATION	III	d,e,f	2	0	0	0

LIST OF AUDIT COURSE II

Code No.	Course	Objectives & Outcomes		L	T	P	C
		PEOs	POs				
18XE21	STRESS MANAGEMENT	III	c,d,e	2	0	0	0
18XE22	DISASTER MANAGEMENT	II,III	c,d,e	2	0	0	0
18XE23	PEDAGOGY STUDIES	III	a,b,d,e	2	0	0	0

18CS11 ENGINEERING MATHEMATICS AND APPLICATIONS 3 0 0 3

Course Objectives

- To understand the basic concepts of fuzzy sets, logics and combinatorics
- To understand the arrival process and various queuing and server models
- To acquire the knowledge of networking in graph theory and its applications

Programme Outcomes (POs)

c. Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

Course Outcomes (COs)

1. Differentiate the advances of set and fuzzy set in a large number of real-life applications and commercial products in the computer field
2. Execute mathematical logic and explore its applications in computer science, with an emphasis on formal specifications and software testing
3. Use generating functions to solve a variety of combinatorial problems
4. Develop the modeling and mathematical skills to analytically determine computer systems and communication network performance.
5. Implement the ideas of graphs for analyzing its nature of data in DBMS and RDBMS.

UNIT I **11 Hours**

FUNDAMENTAL STRUCTURES

Set theory: Relationships between sets - Operations on sets - Set identities - Relations: Binary relations - Partial orderings - Equivalence relations. Functions: Properties of functions - Composition of functions - Inverse functions- Fuzzy sets: Basic definition- Extensions- Fuzzy measures and measures of Fuzziness.

UNIT II **8 Hours**

LOGIC

Propositional logic - Logical connectives - Truth tables - Normal forms (conjunctive and disjunctive) - Predicate logic - Universal and existential quantifiers - Proof techniques -Direct and indirect -Proof by contradiction - Mathematical Induction.

UNIT III **9 Hours**

COMBINATORICS

Basic Combinatorial Numbers- Generating Functions and Recurrence Relations. Inclusion-Exclusion Principles

UNIT IV **9 Hours**

QUEUING MODELS

Poisson Process - Markovian Queues- Single and Multi-server Models -Little's formula -Machine Interference Model - Steady State analysis - Self Service Queue

UNIT V **8 Hours**

GRAPH THEORY

Introduction to Graphs - Graphs operations -Graph and Matrices -Graph Isomorphism- Connected Graphs - Euler Graphs - Hamilton paths and circuits -Shortest path problem.

FOR FURTHER READING

Algebraic laws for Regular Languages- Pumping Lemma and Applications- Properties of Regular Languages- Parse trees and Language Pushdown Automaton.

Total: 45 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. H.-i. Zimmermann, Fuzzy sets & systems with its applications. Fourth Edition Library of Congress Cataloguing-in-Publication Data, 2013.
3. Allen A O , Probability Statistics and Queuing Theory, Academic Press, New Delhi, 2014. Liu C L and Mohapatra D P, Elements of Discrete Maths (Fourth Edition) Tata McGRaw Hill Education Private Limited, New Delhi,2012.
4. Narsingh Deo ,Graph Theory with Applications to Engineering and Computer Science, Prentice-Hall,2017

18CS12 ADVANCED DATA STRUCTURES AND ALGORITHMS 3 0 0 3

Course Objectives

- To understand the techniques for analyzing the complexity of algorithms
- To learn the concepts of advanced data structures
- To design algorithms for solving problems using appropriate data structures

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
c. Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

Course Outcomes (COs)

1. Analyze the complexity of algorithms using Asymptotic notations
2. Design algorithms to perform operations in heap structures and analyze the algorithms for complexity.
3. Analyze the complexity of search tree structures and its algorithms
4. Design algorithms to solve problems using the greedy and divide and conquer Techniques
5. Design algorithms for problem solving using dynamic programming and backtracking methods and analyze it.

UNIT I **8 Hours**

DATA STRUCTURES AND ALGORITHM ANALYSIS

Fundamental Data Structures- Analysis Framework-Asymptotic notations - Conditional asymptotic notation-Mathematical Analysis of Recursive - Recurrence tree method for solving recurrences -Master theorem for solving recurrences- Mathematical Analysis of and Non recursive Algorithms - P, NP and NP completeness.

UNIT II **10 Hours**

HEAP STRUCTURE AND AMORTIZED ANALYSIS

Binary Heap: Basic heap operations-Min/Max heaps - d-heaps - Leftist heaps and property-Leftist heap operations-Binomial queues-Binomial queue structure and operations -implementation of binomial queues- Skew heaps -Fibonacci heaps -Cutting nodes in leftist heaps-Lazy merging for binomial queues - Fibonacci heap operations.

UNIT III **11 Hours**

SEARCH STRUCTURE

Binary search trees- AVL trees - Single rotation-Double rotation- Splay trees- Top- down splay trees-B-trees - Red-Black trees- Bottom-up insertion-Top-down red- black trees - Top-down deletion- 2-3 trees - Insertion and deletion-2-3-4 trees - Insertion and deletion- Hashing-Hash function-Separate chaining - Hash tables without linked lists -Rehashing.

UNIT IV **8 Hours**

GREEDY AND DIVIDE AND CONQUER

Greedy method-Knapsack problem-Tree-vertex splitting-Job sequencing with deadlines - Minimum-cost spanning trees- Prim's algorithm-Kruskal's algorithm- Optimal storage on tapes - Divide-and-conquer-Merge sort-Quicksort -Strassen's matrix multiplication-Convex hull.

UNIT V **8 Hours**

DYNAMIC PROGRAMMING AND BACKTRACKING

Dynamic programming- Multistage graphs - All pairs shortest paths- Single-source shortest paths- 0/1 knapsack -Flow shop scheduling -Backtracking - 8-queens problem - Sum of subsets- Graph coloring-Hamiltonian cycles - Knapsack problem.

FOR FURTHER READING

Treaps - AA trees - k-d trees

Total: 45 Hours

Reference(s)

1. Mark Allen Weiss, Data Structures and Algorithms in C++, Fourth Edition, Pearson,2014.
2. E. Horowitz, S. Sahni and S. Rajasekaran, Computer Algorithms / C++,University Press, 2008
3. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, Prentice Hall of India, New Delhi, 2012
4. Adam Drozdek, Data Structures and Algorithms in C++, Fourth Edition, 2013
5. Anany Levitin, Introduction to The Design and Analysis of Algorithms, Third Edition, Pearson, 2014.

18CS13 ADVANCED COMPUTER ARCHITECTURE 3 0 0 3

Course Objectives

- To introduce the fundamental techniques based on parallel processing.
- To develop the foundations for analyzing the benefits of design options in computer architecture.
- To gain knowledge about the application of the various computing techniques.

Programme Outcomes (POs)

c. Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

Course Outcomes (COs)

1. Analyze the working principle of ILP.
2. Design the advanced techniques for exploiting ILP.
3. Compare the different multiprocessor architectures.
4. Design the cache optimizations and virtual memory.
5. Analyze the different storage systems and its performance measures.

UNIT I **9 Hours**

PIPELINING AND ILP

Fundamentals of computer design-Basic and intermediate concepts of pipelining- Measuring and reporting performance -Instruction level parallelism and its exploitation - Concepts and challenges -Basic compiler techniques for ILP-Reducing branch costs with prediction-Overcoming data hazards with dynamic scheduling -Dynamic branch prediction.

UNIT II **9 Hours**

ADVANCED TECHNIQUES FOR EXPLOITING ILP

Speculation-Multiple issue processors-Compiler techniques for exposing ILP -Limitations on ILP for realizable processors - Hardware versus software speculation-Multithreading: Using ILP support to exploit thread-level parallelism -Performance of advanced multiple issue processors-Efficiency in advanced multiple issue processors

UNIT III **9 Hours**

MULTIPROCESSORS

A taxonomy of parallel architectures- Models for communication and memory architecture - Symmetric and distributed shared memory architectures - Cache coherence issues - Performance issues - Synchronization issues - Models of memory consistency - Interconnection networks - Buses, crossbar-Multi-stage switches.

UNIT IV **9 Hours**

MEMORY HIERARCHY

Introduction - Eleven advanced Optimizations of cache performance - Memory technology and optimizations - SRAM technology-DRAM technology-Protection: Virtual memory and virtual machines-Protection via virtual memory-Protection via virtual machine-Virtual machine monitor-Design of memory hierarchies.

UNIT V **9 Hours**

STORAGE SYSTEMS

Advanced topics in disk storage -Disk power-Advanced topics in disk arrays-Definition and examples of real faults and failures- I/O performance, reliability measures and benchmarks-Throughput versus response time-Transaction processing benchmarks-A Little queuing theory.

FOR FURTHER READING

Hardware and software for VLIW and EPIC-Large scale multiprocessors and scientific applications

Total: 45 Hours

Reference(s)

1. John L. Hennessey and David A. Patterson, Computer Architecture - A quantitative approach. Noida: Morgan Kaufmann / Elsevier, 2019.
2. William Stallings, Computer Organization and Architecture - Designing for Performance. New Delhi: Pearson Education, 2009 seventh edition.
3. John L. Hennessey and David A. Patterson, Computer Organization and Design: The Hardware/Software Interface, Third Edition, 2004.
4. David E. Culler and Jaswinder Pal Singh, Parallel Computing Architecture: A hardware/ software approach. Noida: Morgan Kaufmann / Elsevier, 1999.
5. Harvey G. Cragon,Memory systems and pipelined processors,1999

18CS14 ADVANCED OPERATING SYSTEMS 3 0 0 3

Course Objectives

- To learn the fundamentals of Operating Systems
- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- To gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
- To know the components and management aspects of Real time, Mobile operating systems

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
c. Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

Course Outcomes (COs)

1. Analyze scheduling memory management issues
2. Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
3. Analyze the various resource management techniques for distributed systems
4. Identify the different features of real time and mobile operating systems
5. Apply the available open source kernel of the operating system

UNIT I **9 Hours**

FUNDAMENTALS OF OPERATING SYSTEMS

Overview -Synchronization Mechanisms -Processes and Threads - Process Scheduling -Deadlocks: Detection, Prevention and Recovery -Models of Resources -Memory Management Techniques.

UNIT II **9 Hours**

DISTRIBUTED OPERATING SYSTEMS

Issues in Distributed Operating System - Architecture - Communication Primitives -Lamport's Logical clocks -Causal Ordering of Messages -Distributed Mutual Exclusion Algorithms - Centralized and Distributed Deadlock Detection Algorithms - Agreement Protocols.

UNIT III **9 Hours**

DISTRIBUTED RESOURCE MANAGEMENT

Distributed File Systems -Design Issues - Distributed Shared Memory -Algorithms for Implementing Distributed Shared memory-Issues in Load Distributing - Scheduling Algorithms - Synchronous and Asynchronous Check Pointing and Recovery - Fault Tolerance -Two-Phase Commit Protocol - Nonblocking Commit Protocol -Security and Protection.

UNIT IV **9 Hours**

REAL TIME AND MOBILE OPERATING SYSTEMS

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems -Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems-Micro Kernel Design - Client Server Resource Access - Processes and Threads - Memory Management - File system.

UNIT V **9 Hours**

CASE STUDIES

Linux System: Design Principles - Kernel Modules - Process Management Scheduling - Memory Management - Input-Output Management - File System - Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

FOR FURTHER READING

Memory Management - File Protection- Storage Implementation in Android and iOS.

Total: 45 Hours

Reference(s)

1. Mukesh Singhal and Niranjan G. Shivaratri, Advanced Concepts in Operating Systems - Distributed, Database, and Multiprocessor Operating Systems, Tata McGraw-Hill, 2001.
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, Operating System concepts Seventh Edition, John Wiley & Sons, 2004.
3. Daniel P Bovet and Marco Cesati, Understanding the Linux kernel 3rd edition, O'Reilly, 2005.
4. Rajib Mall, Real-Time Systems: Theory and Practice Pearson Education India, 2006.
5. Neil Smyth, Phone iOS 4 Development Essentials -Xcode, Fourth Edition, Payload media, 2011.

18CS17 DATA STRUCTURES AND ALGORITHMS LABORATORY

0 0 2 1

Course Objectives

- To implement the different data structures in C++
- To introduce mathematical aspects and implement solutions for specific problem
- To implement the different algorithmic design techniques

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems

Course Outcomes (COs)

1. Design and Implement the concepts of linear and non-linear data structures for solving Problems

1 **3 Hours**

EXPERIMENT 1

Design and Implement the concepts of linear and non-linear data structures for solving Problems

2 **3 Hours**

EXPERIMENT 2

Create Min Heap and perform the operations on it

3 **3 Hours**

EXPERIMENT 3

Implement operations on Leftist Heap

4 **3 Hours**

EXPERIMENT 4

Implement merging of two Skew Heaps

5 **3 Hours**

EXPERIMENT 5

Perform rotations on AVL Tree

6 **3 Hours**

EXPERIMENT 6

Implement sorting techniques

7 **3 Hours**

EXPERIMENT 7

Create convex hull using divide and conquer

8 **3 Hours**

EXPERIMENT 8

Job sequencing with deadlines using greedy method

9 **3 Hours**

EXPERIMENT 9

0/1 Knapsack using dynamic programming

10 **3 Hours**

EXPERIMENT 10

Graph coloring using backtracking

Total: 30 Hours

18CS21 ADVANCED DATABASE TECHNOLOGY 3 0 0 3

Course Objectives

- Exemplify the data models and to conceptualize a database system using ER diagrams.
- Interpret the concepts of parallel and distributed databases
- Understand the emerging database technologies

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
c. Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

Course Outcomes (COs)

1. Analyze the basic database system concepts
2. Implement parallel and distributed databases in database technology
3. Apply the object oriented concepts and relations in databases
4. Compare and Implement the active, temporal and deductive databases
5. Analyze the emerging database technology such as cloud and mobile databases

UNIT I **10 Hours**

DATABASE SYSTEM CONCEPTS

Purpose of Database systems - Data Storage and Querying - Database architecture - Data models: Relational model - Entity relationship model: Constraints - Removing redundant attributes in entity sets- Entity-relationship diagrams - Reduction to relational schemas - Entity relationship design issue- Extended E-R features - Alternative notations for modeling Data - Normalization and database design: First normal form, second normal form, third normal form- Boyce codd normal form

UNIT II **7 Hours**

PARALLEL AND DISTRIBUTED DATABASES

Parallel databases: I/O parallelism - Inter and intra query parallelism - Inter and intra operation parallelism -Distributed databases: Homogeneous and Heterogeneous databases - Distributed data storage - Distributed transactions - Commit protocols - Concurrency control- Distributed query processing

UNIT III **8 Hours**

OBJECT AND OBJECT RELATIONAL DATABASES

Concepts for object databases: Object identity - Object structure- Type constructors- Encapsulation of operations -Methods - Persistence- Type and class hierarchies-Inheritance-Complex objects- Object database standards, languages and design: ODMG model- ODL- OQL- Object relational and extended - Relational systems: Object relational features in SQL / Oracle

UNIT IV **11 Hours**

INTELLIGENT DATABASES

Active database concepts and triggers-Temporal databases -Spatial databases- Multimedia databases- Deductive databases- XML databases: structure of XML data - XML Document Schema - Querying and Transformation - Geographic information systems-Genome data management

UNIT V **9 Hours**

EMERGING DATABASE TECHNOLOGIES

Cloud based databases- Mobile Database system - Location and handoff management - Effect of mobility on data management- Location dependent data distribution- Execution Model based on ACID Transaction Framework - Pre-write transaction execution model-Mobile transaction models - Concurrency control - Information retrieval

FOR FURTHER READING

Database Security - Advanced transaction processing- PostgreSQL

Total: 45 Hours

Reference(s)

1. R. Elmasri, and S. B. Navathe, Fundamentals of Database Systems. New Delhi: Pearson Education/Addison Wesley, 2016.
2. Henry F. Korth, Abraham Silberschatz, and S. Sudharshan, Database System Concepts. New Delhi: McGraw Hill, 2010.
3. Vijay Kumar, Mobile Database Systems Wiley Series on Parallel and Distributed Computing, USA, Wiley-Interscience, 2006
4. Thomas Cannolly and Carolyn Begg, Database Systems, A Practical Approach to Design, Implementation and Management. New Delhi: Pearson Education, 2014
5. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems. New Delhi: McGraw Hill, 2014

18CS22 INTERNET AND WEB TECHNOLOGY 3 0 2 4

Course Objectives

- To understand the basic concepts of internet and web technology.
- To interpret the concepts of web-based media-rich programming tools for creating interactive web pages.
- To design and implement the web pages using servlets

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
c. Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

Course Outcomes (COs)

1. Summarize the basic of internet and web concepts
2. Develop web applications using PHP, JSP and client side script technologies with web server.
3. Design and Integrate database environment to web applications being developed
4. Analyze the XML applications with DTD and style sheets that span multiple domains and across various platforms.
5. Implement the real time applications with dynamic variable types and properties, and extensive use of automatic type conversion using servlets.

UNIT I **9 Hours**

THE INTERNET ARCHITECTURE

Introduction- Network concepts- Web concepts- Internet addresses - Retrieving Data with URL - HTML- DHTML: Cascading Style Sheets - Scripting Languages: JavaScript.

UNIT II **8 Hours**

COMMON GATEWAY INTERFACE

Common Gateway Interface: Programming CGI Scripts- HTML Forms- Custom Database Query Scripts- Server Side Includes- Server security issues.

UNIT III **9 Hours**

XML AND RICH INTERNET APPLICATIONS

XML: XSL - XSLT - DOM - RSS - Client Technologies - Adobe Flash - Flex - Microsoft Silver light.

UNIT IV **9 Hours**

SERVER SIDE PROGRAMMING-I

Server side Programming - PHP- Passing variables between pages - Using tables - Form elements - Active server pages- Java server pages.

UNIT V **10 Hours**

SERVER SIDE PROGRAMMING-II

Java Servlets: Servlet container - Exceptions- Sessions and Session Tracking - Using Servlet context- Dynamic Content Generation - Servlet Chaining and Communications - Simple applications - Internet Commerce - Database connectivity.

FOR FURTHER READING

eCommerce- eGovernment - eHR - Development Frameworks - Content Management

1 **6 Hours**

EXPERIMENT 1

Design a web page using CSS (Cascading Style Sheets) which includes the following:
1. Use different font, styles: In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.
2. Set a background image for both the page and single elements on the page. Control the repetition of the image with the background-repeat property.

2 **6 Hours**

EXPERIMENT 2

Validation:
Write JavaScript to validate the following fields of the above registration page.
1. Name (Name should contains alphabets and the length should not be less than 6 characters).
2. Password (Password should not be less than 6 characters length).
3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
4. Phone number (Phone number should contain 10 digits only).

3 **6 Hours**

EXPERIMENT 3

Write an XML file which will display the Book information which includes the following:
1. Title of the book
2. Author Name
3. ISBN number
4. Publisher name
5. Edition
6. Price

Write a Document Type Definition (DTD) to validate the above XML file.
Display the XML file as follows. The contents should be displayed in a table. The header of the table should be in color GREY. And the Author names column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns. Use XML schemas XSL and CSS for the above purpose.
Note: Give at least for 4 books. It should be valid syntactically. Hint: You can use some xml editors like XML-spy

4 **6 Hours**

EXPERIMENT 4

JSP Development:
Write a JSP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.

5 **6 Hours**

EXPERIMENT 5

Accessing cookies from servlet Code:
Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servelet for doing the following.
1. Create a Cookie and add these four users ids and passwords to this Cookie.
2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies. If he is a valid user (i.e., user-name and password match) you should welcome him by name(username) else you should display . You are not an authenticated user . We can use init-parameters to do this. Store the user-names and passwords in the webinf.xml and access them in the servlet by using the getInitParameters() method

Total: 75 Hours

Reference(s)

1. Deitel, Deitel and Neito,-INTERNET and WORLD WIDE WEB - How to program- Pearson education asia, 4th Edition , 2011
2. Mike Mcgrath -PHP & MySQL in easy Steps- Tata McGraw Hill, 2012.
3. Achyut S Godbole and Atul Kahate, -Web Technologies- Second Edition, Tata McGraw Hill, 2012
4. Thomas A Powell, Fritz Schneider, The Complete Reference, Third Edition, Tata McGraw Hill, 2013

18CS23 OBJECT ORIENTED SOFTWARE ENGINEERING

3 0 0 3

Course Objectives

- Learn the basic concepts of software engineering
- Understand the usage of UML diagrams
- Design and test the software project

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
c. Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program
f. Possess knowledge for functioning effectively, as a member or team leader, in software projects considering multidisciplinary environments.

Course Outcomes (COs)

1. Apply the concepts of different UML diagrams
2. Construct software process using effective requirement analysis
3. Implement the object oriented design concepts
4. Organize how to test and manage the software project using object oriented software engineering
5. Analyze the configuration management and project management activities

UNIT I **9 Hours**

INTRODUCTION TO OBJECT ORIENTED SOFTWARE ENGINEERING

Software engineering concepts -Software engineering development activities - Managing software development - Introduction to UML- Modeling concepts -UML diagrams - Project organizations- Project communication concepts- Organizational activities.

UNIT II **9 Hours**

REQUIREMENTS ELICITATION AND ANALYSIS

An overview of requirements elicitation -Requirements elicitation concepts -Requirements elicitation activities - Managing requirements elicitation - Analysis overview -Concepts of analysis - Activities from use cases to objects- Managing analysis.

UNIT III **9 Hours**

SYSTEM DESIGN AND OBJECT DESIGN

Decomposing the system- An overview of system design - System design concepts -System design activities - From objects to subsystems - Addressing design goals - Managing system design - Object design - Reusing pattern solutions - Reuse concepts - Solution objects -Inheritance - Design patterns - Mapping models to code: Mapping concepts- Managing implementation.

UNIT IV **9 Hours**

TESTING AND MANAGING CHANGES

Testing concepts - Testing activities - Component inspection- Managing testing -Rationale management - Rationale concepts - Rationale activities - From issues to decisions -Managing rationale heuristics for communicating about rationale - Issue modeling and negotiation -Conflict resolution strategies.

UNIT V **9 Hours**

CONFIGURATION MANAGEMENT AND PROJECT MANAGEMENT

Configuration management concepts - Configuration management activities -Managing configuration management - Project management - Project management concepts -Classical project management activities - Agile project management activities.

FOR FURTHER READING

Iterative Planning and Project Issues -Iterative Development and Understanding Planning.

Total: 45 Hours

Reference(s)

1. Bernd Bruegge, Allen H., Object-Oriented Software Engineering: Using UML, Patternsand Java, Pearson Education, 2011
2. Timothy C. Lethbridge and Robert Laganiere, Object -Oriented Software Engineering: Practical software development using UML and Java, McGraw-Hill Higher Education, 2013
3. Sommerville, Software Engineering, Pearson Education,2009
4. Roger S. Pressman. Software Engineering - A Practitioner's Approach, McGraw-Hill International Edition, 2010
5. Stephen R. Schach, Object-Oriented Classical Software Engineering, McGraw Hill, 2010.

18CS24 COMPILER CONSTRUCTION AND OPTIMIZATION

3 0 0 3

Course Objectives

- To understand the theory and practice of compiler implementation
- To learn finite state machines and compiler parsing techniques
- To understand code generation and optimization of codes

Programme Outcomes (POs)

c. Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

Course Outcomes (COs)

1. Construct finite automata and apply the knowledge of lex tool to develop a scanner
2. Build parser and apply the knowledge of yacc tool to develop a parser
3. Design and conduct experiments for intermediate code generation and code optimization

UNIT I **9 Hours**

LEXICAL ANALYSIS

Role of the lexical analyzer - Input buffering - Specification and recognition of tokens- The lexical-analyzer generator Lex- Finite automata - Regular expression to finite automation - Design of a lexical-analyzer generator-Optimization of DFA-Based pattern matchers

UNIT II **9 Hours**

SYNTAX ANALYSIS

Role of a parser - Context-free grammars -Writing a grammar - Top-down parsing -Bottom-up parsing : Reductions-Handle pruning- Shift-reduce parsing -Conflicts during shift -reduce parsing - LR parsers : Simple LR -Canonical LR -LALR -Parser generators : YACC

UNIT III **9 Hours**

INTERMEDIATE-CODE GENERATION AND CODE OPTIMIZATION

Variants of syntax trees - Three-Address Code - Types and declarations- Control flow- Backpatching. Basic blocks and flow graphs -Principal sources of optimization - Introduction to data flow analysis - Peephole optimization - Register allocation and assignment

UNIT IV **9 Hours**

CODE GENERATION AND INSTRUCTION LEVEL PARALLELISM

Issues in the design of a code generator - Target language -Addresses in the target code - Simple code generator. Processor architectures-Code-scheduling constraints-Basic-block scheduling -Global code scheduling

UNIT V **9 Hours**

OPTIMIZING FOR PARALLELISM AND LOCALITY

Basic Concepts -Matrix multiply -Iteration spaces- Affine array indexes : Affine access -Affine and nonaffine access in practice -Data reuse : Types of reuse -Self reuse -Self-spatial reuse -Group reuse

FOR FURTHER READING

Pipelining -Locality Optimizations

Total: 45 Hours

Reference(s)

1. Alfred V.Aho, Monica S. Lam, Ravi Sethi and Jeffrey D.Ullman, Compilers -Principles, Techniques and Tools, second edition, Pearson Education, New Delhi, 2014.
2. Keith D Cooper and Linda Torczon, Engineering a Compiler, Elsevier Science, 2011 Raghavan V, Principles of Compiler Design, Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 2009
3. D. Grune, H.E. Bal, C.J.H. Jacobs, K.G. Langendoen, Modern Compiler Design, Wiley, 2008
4. Dhamdhere D M, Compiler Construction Principles and Practice, Second edition, Macmillan India Ltd., New Delhi, 2001

18CS27 DATABASE TECHNOLOGY LABORATORY 0 0 2 1

Course Objectives

- To study and implement the basic SQL commands
- To implement the database design in PL/SQL
- To implement distributed database, active databases and parallel databases

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
c. Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

Course Outcomes (COs)

1. Execute the basic SQL commands in ORACLE
2. Develop PL/SQL programs in ORACE
3. Implement intelligent databases in MYSQL and ORACLE

1 **3 Hours**

EXPERIMENT 1
Working basic SQL commands (DDL, DML, DCL, and TCL)

2 **3 Hours**

EXPERIMENT 2
Executing Single Row and Group functions

3 **3 Hours**

EXPERIMENT 3
Running SQL queries on Join and Integrity constraints

4 **3 Hours**

EXPERIMENT 4
Implement Simple programs using PL/SQL blocks

5 **3 Hours**

EXPERIMENT 5
Apply the concepts of Exception handling in PL/SQL block

6 **3 Hours**

EXPERIMENT 6
Create Cursors and package in PL/SQL block

7 **3 Hours**

EXPERIMENT 7
Use the concept of Procedures and Function in PL/SQL block

8 **3 Hours**

EXPERIMENT 8
Implement Distributed Database for Bookstore

9 **3 Hours**

EXPERIMENT 9
Active Database -Implementation of Triggers and Assertions for Bank Database

10 **3 Hours**

EXPERIMENT 10
Implement Parallel Database of University Counseling for Engineering colleges

Total: 30 Hours

18CS31 DATA WAREHOUSING AND DATA MINING 3 0 0 3

Course Objectives

- Understand the basic concepts of data mining
- Familiarize with the data mining functionalities
- Assess the strengths and weaknesses of various data mining techniques

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
c. Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Implement the data warehouse architecture
2. Explain the functionalities of data mining
3. Explore the different data preprocessing techniques
4. Identify the association rules using frequent itemset mining algorithms
5. Describe the classification and clustering techniques

UNIT I **7 Hours**

DATA WAREHOUSING

Introduction- Data Warehouse - Multidimensional data model - Data warehouse architecture - Steps for the design and construction of data warehouses, Three-tier data warehouse architecture, Data warehouse back-end tools and utilities, Metadata Repository - Types of OLAP Servers - Data warehouse implementation

UNIT II **9 Hours**

INTRODUCTION TO DATA MINING

Introduction - The evolution of database system technology - Steps in knowledge discovery from database process - Architecture of a data mining systems - Data mining on different kinds of data - Different kinds of pattern - Technologies used - Applications - Major issues in data mining - Classification of data mining systems - Data mining task primitives - Integration of a data mining system with a database or data warehouse system

UNIT III **10 Hours**

DATA PREPROCESSING

Data Objects and attribute types - Basic statistical description of data - Data visualization - Measuring data similarity and dissimilarity - Data cleaning - Integration - Data reduction - Data transformation and data discretization

UNIT IV **9 Hours**

ASSOCIATION RULE MINING

Basic concepts - Frequent itemset mining methods - Apriori algorithm, a pattern growth approach, Vertical data format, Closed and max patterns - Pattern mining in multilevel and multidimensional space - Constraint based frequent pattern mining

UNIT V **10 Hours**

CLASSIFICATION AND CLUSTERING

General approach to classification - Decision tree induction - Bayes classification methods-Rule Based Classification- Metrics for evaluating classifier performance - Prediction - Cluster Analysis - Partitioning methods - Hierarchical methods

FOR FURTHER READING

Applications of data mining-Social impacts of data mining-Tools

Total: 45 Hours

Reference(s)

1. Jiawei Han, Micheline Kamber and Jian Pai, Data Mining: Concepts and Techniques, Morgan Kauffman, 2013
2. Alex Berson and Stephen J Smith, Data Warehousing, Data Mining, and OLAP, Mcgraw-Hill, 1997
3. David Hand, Heikki Manila, Padhraic Symth, Principles of Data Mining, MIT Press, 2001
4. Margaret H.Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education 2003

CORE ELECTIVES

18CS51 AGENT BASED INTELLIGENT SYSTEMS 3 0 0 3

Course Objectives

- To introduce the fundamental concepts of artificial intelligence
- To explore the different paradigms in knowledge representation and reasoning
- To recognize problems to solve using artificial intelligence and machine learning

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Apply searching techniques, heuristic algorithms and problems in artificial intelligence
2. Implement the knowledge representation and reasoning techniques in logic programming
3. Execute the plan construction with planning agents
4. Analyze the concept in presence of uncertainty
5. Apply various artificial intelligence techniques in intelligent system development

UNIT I **9 Hours**

INTRODUCTION

Definitions - Intelligent agents: Nature of environment-Structure of agents-problem solving-Searching: uninformed search strategies-Searching with partial information -Heuristics: Local search algorithms - Constraint satisfaction problems: Backtracking search - Game playing: Optimal decisions-Alpha, Beta pruning.

UNIT II **9 Hours**

KNOWLEDGE REPRESENTATION AND REASONING

Logical Agents: Propositional logic-Reasoning patterns in propositional logic-Agent based propositional logic-First order logic: Syntax and semantics-First order inference: Unification-Chaining- Resolution strategies-Knowledge representation: Objects-Actions-Events

UNIT III **9 Hours**

PLANNING AGENTS

Planning problem: State space search-Partial order planning-Graphs-Hierarchical network planning-Nondeterministic domains-Conditional planning-Execution monitoring and replanning-Continuous planning-Multi agent planning.

UNIT IV **9 Hours**

AGENTS AND UNCERTAINTY

Acting under uncertainty - Probability notation-Bayes rule and use -Probabilistic reasoning: Bayesian networks-Other approaches-Time and uncertainty: Temporal models-Simple decisions: Utility theory - Decision network - Complex decisions: Value iteration-Policy iteration.

UNIT V **9 Hours**

HIGHER LEVEL AGENTS

Knowledge in learning: Explanation based learning-Relevance information-Statistical learning methods: Instance based learning-Neural network-Reinforcement learning: Passive and active communication: Formal grammar- Augmented grammars-Future of AI.

FOR FURTHER READING

Probabilistic language processing - Perception-Robotics - Prolog Programming for Artificial Intelligence.

Total: 45 Hours

Reference(s)

1. Stuart Russell and Peter Norvig, Artificial Intelligence - A Modern Approach, Pearson Education Limited, 2014.
2. Elaine Rich, Kevin Knight and Shivashankar B Nair, Artificial Intelligence, Tata McGraw Hill, 2009.
3. M. Tim Jones, Artificial Intelligence: A Systems Approach, Jones and Bartlett Publisher, 2010.
4. David L. Poole, Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
5. Bratko, I., Prolog Programming for Artificial Intelligence (International Computer Science Series), Addison-Wesley Educational Publishers Inc; 4th edition, 2011.

18CS52 SOFT COMPUTING 3 0 0 3

Course Objectives

- To conceptualize the working of human brain using neural networks
- Summarize and apply the methodologies involved in solving problems related to Fuzzy Logic, Various fuzzy systems and Rough sets
- Provide the mathematical background for carrying out the optimization and familiarizing genetic algorithm for seeking global optimum in self-learning situation
- Develop some familiarity with current research problems and research methods in Soft Computing by working on a research or design project

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Apply the soft computing technology for real time applications with the identification of the components
2. Analyze Fuzzy logic & Rough set theory for developing expert system
3. Design of various neural networks based on supervised and unsupervised learning network
4. Implement the concept and applications of Genetic Algorithms for real life problem
5. Apply the Hybrid Soft Computing Techniques for getting optimized solution

UNIT I **9 Hours**

INTRODUCTION

Introduction to Soft Computing - Components of Soft Computing - Various types of soft computing technique, Differentiate Hard and Soft Computing, Soft Computing Constituents, Neuro Fuzzy and Soft Computing Characteristics, Evolution of neural networks- basic models - important technologies-applications.

UNIT II **9 Hours**

FUZZY LOGIC

Fuzzy set theory - crisp sets - fuzzy sets - crisp relations - Fuzzy relations - Fuzzy systems- Crisp logic - predicate logic - fuzzy logic- fuzzy based systems-Membership functions: features, fuzzification, methods of membership value assignments - Defuzzification methods - applications-Fuzzy Inference Systems - Design of Fuzzy Controller- Introduction to Rough Sets-Comparisons of Fuzzy sets and rough sets

UNIT III **9 Hours**

NEURAL NETWORKS

McCulloch-Pitts neuron - linear separability - hebb network - supervised learning network: perceptron networks - adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN- associative memory network: auto-associative memory network, hetero-associative memory network, BAM, hopfield networks, iterative auto associative memory network & iterative associative memory network - unsupervised learning networks: Kohonen self-organizing feature maps, LVQ - CP networks, ART network.

UNIT IV **9 Hours**

GENETIC ALGORITHMS

Genetic algorithm and search space - general genetic algorithm - operators - Generational cycle - stopping condition - constraints - classification - genetic programming - multilevel optimization - real life problem-advances in GA

UNIT V **9 Hours**

HYBRID SOFT COMPUTING TECHNIQUES

Neuro-fuzzy hybrid systems - genetic neuro hybrid systems - genetic fuzzy hybrid and fuzzy genetic hybrid systems - simplified fuzzy ARTMAP - Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

FOR FURTHER READING

Use of data sets available on Kaggle for implementation and comparison of different techniques with help of MATLAB.

Total: 45 Hours

Reference(s)

1. S.Rajasekaran and G.A.Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications, Prentice-Hall of India Pvt. Ltd., 2017.
2. S.N. Sivanandam, S.N. Deepa. Principles Of Soft Computing, 2nd Edition,Wiley Publisher,2011
3. David E. Goldberg,Genetic Algorithm in Search Optimization and Machine Learning,Pearson Education India, 2013.
4. J.S.R.Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI / Pearson Education 2008
5. Mitsuo Gen and Runwei Cheng,"Genetic Algorithms and Engineering Optimization", Wiley Publishers 2000.

18CS53 PATTERN RECOGNITION 3 0 0 3

Course Objectives

- To know the fundamental algorithms for pattern recognition
- To instigate the various classification techniques
- To originate the various structural pattern recognition and feature extraction techniques

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Apply various algorithms for pattern classifier and recognition
2. Implement the concepts of Unsupervised classification in pattern recognition
3. Analyze the structural pattern recognition and feature extraction techniques
4. Apply the feature selection and extraction in pattern recognition
5. Create the recent advances of neural network in pattern recognition

UNIT I **9 Hours**

PATTERN CLASSIFIER

Overview of pattern recognition - Discriminant functions - Supervised learning - Parametric estimation - Maximum likelihood estimation - Bayesian parameter estimation - Perception algorithm - LMSE algorithm - Problems with Bayes approach - Pattern classification by distance functions - Minimum distance pattern classifier.

UNIT II **9 Hours**

UNSUPERVISED CLASSIFICATION

Discrete and Binary classification -Techniques to directly obtain linear classifiers - Clustering for unsupervised learning and classification - Clustering concept - C-means algorithm -Hierarchical clustering procedures - Graph theoretic approach to pattern clustering - Validity of clustering solutions.

UNIT III **9 Hours**

STRUCTURAL PATTERN RECOGNITION

Elements of formal grammars - String generation as pattern description - Recognition of syntactic description - Parsing - Stochastic grammars and applications - Graph based structural representation.

UNIT IV **9 Hours**

FEATURE EXTRACTION AND SELECTION

Entropy minimization - Karhunen - Loeve transformation - Feature selection through functions approximation - Binary feature selection.

UNIT V **9 Hours**

RECENT ADVANCES

Neural network structures for pattern recognition - Neural network based pattern associators - Unsupervised learning in neural pattern recognition - Self organizing networks - Fuzzy logic - Fuzzy pattern classifiers -Pattern classification using Genetic Algorithms.

FOR FURTHER READING

Multilayer, Feed forward Network Structure -Delta Rule -Generalized data rule.

Total: 45 Hours

Reference(s)

1. Robert J.Schalkoff, Pattern Recognition: Statistical, Structural and Neural Approaches, John Wiley & Sons Inc., New York, 2007.
2. Tou and Gonzales, Pattern Recognition Principles, Wesley Publication Company, London, 1974.
3. Duda R.O. and Hart.P.E., Pattern Classification and Scene Analysis, Wiley, New York, 1973.
4. Morton Nadier and Eric Smith P., Pattern Recognition Engineering, John Wiley & Sons, New York, 1993.

18CS54 SEMANTIC WEB 3 0 0 3

Course Objectives

- To understand the importance of Resource Description Framework in semantic web
- To study the scope of ontology for semantic web
- To know the applications of semantic web

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Analyze the basics of semantics web and XML.
2. Explain the significance of RDF and basics of SPARQL.
3. Illustrate the ontology for semantic web.
4. Apply the logic and inference rules in semantic web.
5. Develop the applications of semantic web technologies.

UNIT I **10 Hours**

INTRODUCTION

Semantic web vision: History -Semantic web examples-Semantic web technologies -Layered Approach - Structured Web Documents XML: Structuring -Namespaces -Addressing and querying XML documents - Processing.

UNIT II **9 Hours**

RDF AND QUERYING THE SEMANTIC WEB

RDF Basics - XML based syntax - RDF schema-RDF and RDF schema in RDF schema-An axiomatic semantics for RDF and RDF schema-Querying in SPARQL.

UNIT III **9 Hours**

WEB ONTOLOGY

Introduction -OWL and RDF / RDFS -Sublanguages of OWL -Layering of OWL -Future Extensions - Ontology Engineering: Introduction -Constructing ontologies -Reusing Existing Ontologies -Ontology Mapping - On-to-knowledge semantic web architecture.

UNIT IV **9 Hours**

LOGIC AND INFERENCE RULES

Introduction -Monotonic rules: Syntax and semantics -Description Logic Programs (DLP) - Semantic Web Rules Language (SWRL) - Non- monotonic rules: Motivation, syntax and examples -Rule markup in Language (RuleML) XML.

UNIT V **8 Hours**

APPLICATIONS OF SEMANTIC WEB TECHNOLOGIES

Horizontal Information Products at Elsevier -Open academia: Distributed Publication Management - Data Integration at Audi - Skill Finding at Swiss Life - Think Tank Portal at EnerSearch- e-Learning - Constructing Ontologies Manually - Reusing Existing Ontologies - Semiautomatic Ontology Acquisition.

FOR FURTHER READING

Horizontal Information Products at Elsevier - Openacademia: Distributed Publication Management - Bibster: Data Exchange in a Peer-to-Peer System - Data Integration at Audi - Skill Finding at Swiss Life - Think Tank Portal at EnerSearch - e-Learning.

Total: 45 Hours

Reference(s)

1. Grigorous Antoniou and Van Hermelen, A Semantic Web Primer. New Delhi: The MIT Press,2012.
2. James Hendler, Henry Lieberman and Wolfgang Wahlster, Spinning the Semantic, 2013.
3. Shelley Powers, Practical RDF. Mumbai: O'reilly publishers, 2015.
4. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, Chapman & Hall/CRC, 2016.
5. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, CRC press, Taylor and Francis Group, New york, 2015.

18CS55 NATURAL LANGUAGE PROCESSING 3 0 0 3

Course Objectives

- To tag a given text with basic Language processing features and design an innovative application using NLP components.
- Implement a rule based system to tackle morphology/syntax of a Language.
- Design a tag set to be used for statistical processing keeping an application in mind.
- Compare and contrast use of different statistical approaches for different types of applications.

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Identify the basics of Natural Language Processing and Machine learning.
2. Analyze the tagging of text and models in speech tagging.
3. Recognize parsing with syntax and grammars.
4. Characterize the semantic analysis in natural language processing.
5. Apply natural language processing in various applications.

UNIT I **9 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 **8 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 **11 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 **9 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- IE using sequence labeling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment- phrase-based translation -Question Answering

FOR FURTHER READING

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

Total: 45 Hours

Reference(s)

1. Daniel Jurafsky and James H. Martin Speech and Language Processing, Prentice Hall; second edition, 2008
2. Foundations of Statistical Natural Language Processing by Christopher D. Manning and Hinrich Schuetze, MIT Press, 1999
3. Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O'Reilly Media; First edition, 2009
4. Roland R. Hausser, Foundations of Computational Linguistics: Human - Computer Communication in Natural Language, Paperback, MIT Press, 2011

18CS56 BIG DATA ANALYTICS 3 0 0 3

Course Objectives

- To understand the fundamental concepts of Big Data
- To gain in-depth knowledge about the Hadoop Architecture and YARN
- To apply the key concepts of Hadoop framework, MapReduce, Pig, Hive, and Zoo Keeper

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Analyze the Big Data concepts, file system and Applications
2. Apply the knowledge of Hadoop I/O and Data visualization techniques
3. Analyze the Hadoop and Map Reduce framework associated with big data
4. Apply the fundamentals of Hadoop YARN and Map Reduce Programming for Big Data Applications
5. Develop the applications Using Pig, Hive and Zoo Keeper

UNIT I **9 Hours**

INTRODUCTION TO BIG DATA

Introduction - Four Vs, Drivers for Big data, Big data analytics, Big data applications. Challenges of conventional systems -Intelligent data analysis -Nature of data - Analytic processes and tools - Analysis Vs Reporting - Modern data analytic tools.

UNIT II **9 Hours**

INTRODUCTION TO HADOOP

Big Data -Apache Hadoop & Hadoop EcoSystem -Moving Data in and out of Hadoop -Understanding inputs and outputs of MapReduce - Data Serialization -Data Visualization techniques Introduction to Spark.

UNIT III **9 ours**

HADOOP ARCHITECTURE

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, Job, Task trackers - Cluster Setup -SSH & Hadoop Configuration -HDFS Administering -Monitoring & Maintenance.

UNIT IV **9 Hours**

HADOOP ECOSYSTEM AND YARN

Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features NameNode High Availability, HDFS Federation, Map Reducev2, YARN, Running Map Reducev1 in YARN.

UNIT V **9 Hours**

HIVE, PIG AND HBASE

Hive Architecture and Installation, Comparison with Traditional Database, HiveQL -Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase concepts Advanced Usage, Schema Design, Advance Indexing - Mahout - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

FOR FURTHER READING

Data streaming Techniques- Big Data Case Study - Business Intelligence Tools.

Total: 45 Hours

Reference(s)

1. Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, Professional Hadoop Solutions, Wiley, ISBN: 9788126551071, 2015.
2. Tom Plunkett, Brian Macdonald et al, Oracle Big Data Handbook, Oracle Press, 2014.
3. Vignesh Prajapati, Big Data Analytics with R and Hadoop, Packet Publishing 2013.
4. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2013.
5. Tom White, HADOOP: The definitive Guide , O'Reilly 2012.

18CS57 ADVANCED COMMUNICATION NETWORKS 3 0 0 3

Course Objectives

- To understand the wired, wireless LANs and backbone networks
- To gain in-depth knowledge about the routing protocols
- To interpret congestion control and traffic management

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Identify the requirements to choose the appropriate network structure for real time issues.
2. Differentiate the functionalities and modes of operation of protocols in the network architecture.
3. Analyze the process of flow control mechanisms to fulfill networking requirements in wired and wireless technology.
4. Apply the concepts of high speed networking and to create optimal systems.
5. Demonstrate the interior and exterior routing protocols across the network.

UNIT I **9 Hours**

REVIEW OF NETWORKING CONCEPTS

Traffic characterization and quality of service, network services, high-performance networks,- Implementing network software -Layered architecture, Open data network model, performance - Reliable transmission -Ethernet and multiple access network (802.3) -Wireless - 802.11/Wi-Fi - Bluetooth/802.15.1 - Cell phone technologies.

UNIT II **8 Hours**

INTERNETWORKING AND END TO END PROTOCOL

Switching and bridging -Datagrams - Virtual circuit switching - Source routing - Bridges and LAN switches -Basic internetworking (IP) - Service model - Global addresses - Datagram forwarding in IP - Subnetting and classless addressing - Address translation - Host configuration - Error reporting - Virtual networks and tunnels -Simple Demultiplexer (UDP) -Reliable byte stream (TCP) -Remote procedure call (RPC).

UNIT III **10 Hours**

CONGESTION AND TRAFFIC MANAGEMENT

Effects of congestion -Traffic management -Congestion control in packet - Switching networks-Frame relay congestion control -Need for flow and error control -Link control mechanisms -ARQ Performance - TCP flow and congestion control - Traffic control.

UNIT IV **10 Hours**

ATM NETWORK

ATM network, features, addressing, signaling, routing, ATM header structure, ATM adaptation layer (AAL), management and control, BISDN, internetworking with ATM- Optical networks, WDM systems, Cross connects, optical LAN, optical paths and networks.

UNIT V **8 Hours**

INTERNET ROUTING

Overview of graph theory and Least - cost paths -Interior routing protocols -Internet routing principles - Distance vector and link state protocol -Exterior routing protocols: BGP and IDRP multicasting.

FOR FURTHER READING

VPN -Remote - Access VPN, site - to - site VPN, tunneling to PPP, security in VPN,MPLS -Operation, routing, tunneling and use of FEC.

Total: 45 Hours

Reference(s)

1. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, Morgan Kaufmann,2012.
2. William Stallings, High - Speed Networks and Internets: Performance and Quality of Service, Pearson Education, 2010.
3. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, Pearson Education, 2011.
4. Behrouz Forouzan, Data communications and Networking, Tata Mc Graw Hill Education, 2009.
5. James F. Kurose and Keith W. Ross, Computer Networking: A Top - Down Approach, Pearson Education, 2013.

18CS58 NETWORK ENGINEERING AND MANAGEMENT 3 0 0 3

Course Objectives

- To impart knowledge about the basic concepts of computer networks and the functions of different layers in OSI model.
- To discuss the architecture and functions of different network components.
- To understand and analyze the implementation of network management protocol.

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems

d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.

e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Interpret the basic components of data communication and the functions of different layers in OSI model.
2. Differentiate the functions performed by data link layer and network layer.
3. Compare the different versions of network management protocol model.
4. Analyze the use of remote monitoring and telecommunications in managing networks.
5. Analyze the applications of broadband network management.

UNIT I **8 Hours**

FOUNDATIONS OF NETWORKING

Data communication networks -Protocols and standards -OSI model -Layers in OSI -TCP/IP protocol suite -Error detection and correction -Flow control -Error control

UNIT II **9 Hours**

DATA LINK LAYER AND NETWORK LAYER

SONET architecture -Layers -Frames -STS multiplexing -SONET networks -Frame relay- IPv4 Address - IPv6 address -Internetworking -Transition from IPv4 to IPv6 -Address mapping ICMP-IGMP -ICMPv6 - Congestion control

UNIT III **10 Hours**

SNMPV1, SNMPV2 AND SNMPV3

SNMPv1 History - Organization model -Information model - Communication model-Functional model-SNMPv2:System architecture-Structure of management information-Management information base - SNMP v2 protocol -Compatibility with SNMPv1-SNMPv3 Key features-Documentation architecture - Applications -MIB -Security

UNIT IV **9 Hours**

RMON AND TELECOMMUNICATIONS MANAGEMENTNETWORK

Remote monitoring - RMON SMI and MIB - RMON1 - RMON2- ATM Remote monitoring - TMN - TMN conceptual model -TMN architecture - TMN management service architecture -TMN integrated view -TMN implementation

UNIT V **9 Hours**

BROADBAND NETWORK MANAGEMENT

Broadband networks and services, ATM Technology-VP,VC, ATM Packet, Integrated service, ATMLAN emulation, virtual LAN- ATM network management-ATM network reference model, integrated local management Interface- ATM management information base, Role of SNMD and ILMI in ATM

FOR FURTHER READING

Configuration management, Fault management, Performance management, Early web based development, CORBA-based NM technology, XML-based NM technology - Recent NM-related standards

Total: 45 Hours

Reference(s)

1. Behrouz A. Forouzan, Data Communication and Networking,New Delhi: Tata McGraw Hill, 2012
2. Mani Subramanian, Network Management Principles and practices, New Delhi Pearson Education, 2013
3. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, Noida: Morgan Kaufman Publishers, 2012
4. William Stallings, SNMP, SNMPv2, SNMPv3 and RMON1 and RMON2, New Delhi: Pearson Education, 2012

18CS59 MOBILE AND PERVASIVE COMPUTING 3 0 0 3

Course Objectives

- To introduce the characteristics, basic concepts and systems issues in mobile and pervasive computing
- To illustrate architecture and protocols in pervasive computing and to identify the trends and latest development of the technologies in the area
- To design successful mobile and pervasive computing applications and services

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Explicate emerging technologies in wireless networks.
2. Illustrate about the transmission methods and data management in mobile computing.
3. Analyze the working principle of location management.
4. Apply the principles of pervasive computing.
5. Outline the characteristics of pervasive computing applications including the major system components and architectures of the systems.

UNIT I **9 Hours**

INTRODUCTION

Wireless networks- emerging technologies- Blue tooth, WiFi, WiMAX, 3G ,WATM.-Mobile IP protocols -WAP push architecture-WML scripts and applications.

UNIT II **8 Hours**

MOBILE COMPUTING

Mobile computing environment-functions-architecture-design considerations, content architecture - CC/PP exchange protocol, context manager-Data management in WAE-Coda file system- caching schemes- Mobility QOS- Security in mobile computing.

UNIT III **8 Hours**

LOCATION MANAGEMENT

Handoff in wireless mobile networks-model-handoff schemes- Location management in cellular networks - Mobility models- location and tracking management schemes- time, movement, profile and distance based update strategies- ALI technologies.

UNIT IV **10 Hours**

PERVASIVE COMPUTING

Pervasive Computing- Principles, Characteristics- interaction transparency, context aware, automated experience capture- Architecture for pervasive computing- Pervasive devices-embedded controls- smart sensors and actuators -Context communication and access services.

UNIT V **10 Hours**

SERVICE DISCOVERY

Open protocols- Service discovery technologies- SDP, Jini, SLP, UpnP protocols-data synchronization- SyncML framework - Context aware mobile services -Context aware sensor networks, addressing and communications- Context aware security

FOR FURTHER READING

Study of various network simulators (GloMoSim, NS-2,Opnet)

Total: 45 Hours

Reference(s)

1. Ivan Stojmenovic , Handbook of Wireless Networks and Mobile Computing, John Wiley & sons Inc, Canada, 2002.
2. Asoke K Taukder, Roopa R Yavagal, Mobile Computing, Tata McGraw Hill Pub Co. , New Delhi, 2005.
3. Seng Loke, Context-Aware Computing Pervasive Systems, Auerbach Pub., New York, 2007.
4. Frank Adelstein Sandeep K. S. Gupta Golden G. Richard III Loren Schwie bert-Fundamentals of Mobile and Pervasive Computing, McGraw-Hill, 2005.
5. Jochen Burthardt et al, Pervasive Computing: Technology and Architecture of Mobile Internet Applications, Pearson Education, 2009.

18CS60 ADHOC AND WIRELESS SENSOR NETWORKS 3 0 0 3

Course Objectives

- Learn about the issues in the design of wireless ad hoc networks
- Understand the working of protocols in different layers of mobile ad hoc and sensor networks
- Understand security issues in ad hoc and sensor networks

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Compare the architectural designing issues of wireless ad-hoc networks with MAC.
2. Apply the routing mechanism on ad-hoc wireless networks.
3. Construct the applications and analyze the challenges of wireless sensor network protocols.
4. Design the protocols on wireless sensor network.
5. Apply the network security techniques on ad-hoc and sensor network.

UNIT I **9 Hours**

AD-HOC WIRELESS NETWORKS AND MAC

Fundamentals of WLANs -IEEE 802.11 architecture -Applications of Ad-Hoc wireless networks-Issues in ad-Hoc wireless networks -MAC protocols for Ad-Hoc wireless networks Contention based protocols - TCP over ad-hoc networks-TCP protocol overview - TCP and MANETs -Solutions for TCP over ad-hoc networks.

UNIT II **10 Hours**

ROUTING PROTOCOLS FOR AD-HOC WIRELESS NETWORKS

Routing in ad-hoc networks- Introduction -Topology based versus position based approaches -Proactive - reactive - hybrid routing approach - Principles and issues -Location services -DREAM -Quorums based location service -Grid forwarding strategies -Greedy packet forwarding -Restricted directional flooding- Hierarchical routing- Power-aware routing protocols.

UNIT III **9 Hours**

WIRELESS SENSOR NETWORKS AND MAC

Introduction-WSN applications-Factors influencing WSN design-Wireless Fidelity Systems-MAC challenges- Protocols Contention based- S-MAC-B-MAC-CC-MAC- Other contention based MAC protocols Reservation based mechanism-TRAMA-Other reservation based mechanism-Hybrid mechanism Zebra-MAC.

UNIT IV **9 Hours**

WSN ROUTING PROTOCOLS AND LOCALIZATION

Challenges for routing- Data-centric and Flat-architecture protocols- Flooding- Gossiping-Sensor SPIN - Directed diffusion-Hierarchical protocols: LEACH - PEGASIS - TEEN and APTEEN Geographical routing protocols- QoS-based protocols-Localization in WSN- Ranging techniques Range-Based localization protocols- Range-free localization protocols.

UNIT V **8 Hours**

AD-HOC AND SENSOR NETWORK SECURITY

Security in ad-hoc and sensor networks -Key distribution and management -Software based anti-tamper techniques -Water marking techniques -Defense against routing attacks - Secure ad-hoc routing protocols -Sensor network security protocols -SPINS.

FOR FURTHER READING

Integrating MANETs, WLANs and cellular networks -Heterogeneous architecture -Mobile user stations.

Total: 45 Hours

Reference(s)

1. C.Siva Ram Murthy and B.S.Manoj, Ad Hoc Wireless Networks -Architectures and Protocols, Pearson Education, 2011.
2. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, Ad-Hoc and Sensor Networks: Theory and Applications, Second Edition, World Scientific Publishing, 2011.
3. Ian F. Akyildiz, Mehmet Can Vuran , Wireless Sensor Network, John Wiley & Sons, 2010.
4. Erdal Cayirci , Chunming Rong, Security in Wireless Ad Hoc and Sensor Networks, John Wiley and Sons, 2009.
5. Waltenegus Dargie, Christian Poellabauer, Fundamentals of Wireless Sensor Networks Theory and Practice, John Wiley and Sons, 2010.

18CS61 CLOUD SYSTEMS AND INFRASTRUCTURES 3 0 0 3

Course Objectives

- To understand the key elements of cloud platform
- To explore cloud services and infrastructure
- To impart knowledge in applications of cloud computing

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Identify the systems and mechanisms to support cloud computing.
2. Apply the concept of virtualization to create shared resource pool environment.
3. Categorize the different types of available cloud web services.
4. Analyze the cloud infrastructures with data security.
5. Explain SOA, Cloud applications and its APIs.

UNIT I **9 Hours**

INTRODUCTION

Defining cloud computing -Cloud types -Characteristic of computing -benefits and disadvantages of cloud computing -Accessing the role of open standards -Measuring the cloud value -Exploring the cloud computing Stack-Connecting to the cloud -Understanding services and applications by type.

UNIT II **10 Hours**

CLOUD PLATFORMS

Understanding Abstraction and Virtualization -Using virtualization technique -Load balancing and virtualization -Understanding hypervisors -Undemanding machine imaging -Porting applications -Capacity planning -Baseline and metrics -Network capacity -Scaling -Exploring Platform as a Service -Defining Services -Using PaaS Application Frameworks.

UNIT III **9 Hours**

CLOUD COMPUTING WEB SERVICES

Google Web service -Surveying the Google application portfolio -Google toolkit -Amazon web services -Components and services -EC2- Storage systems -Database services- Microsoft cloud services -Windows azure platform -Windows live.

UNIT IV **8 Hours**

CLOUD INFRASTRUCTURES

Managing the Cloud -Administrating the Clouds -Cloud Management Products -Emerging Cloud Management Standards -Understanding Cloud Security -Securing the Cloud -Securing Data -Establishing Identity and Presence.

UNIT V **9 Hours**

CLOUD SERVICES AND APPLICATIONS

Understanding Service Oriented Architecture -Introducing Service Oriented Architecture -Defining SOA Communications -Relating SOA and Cloud Computing -Moving Applications to the Cloud -Applications in the Clouds -Applications and Cloud APIs -Working with Cloud-Based Storage.

FOR FURTHER READING

Using the Mobile Cloud -Working with Mobile Devices -Working with Mobile Web Services.

Total: 45 Hours

Reference(s)

1. Barrie Sosinsky, Cloud Computing Bible, Wiley Publishing, Inc, 2011.
2. Rajkumar Buyya, Christian Vecchiola and Thamari Selvi S , Mastering in Cloud Computing, McGraw Hill Education (India) Private Limited, 2013.
3. Michael Miller,Cloud Computing, Pearson Education, New Delhi, 2012.
4. Anthony T Velte, Cloud Computing: A practical Approach, Tata McGraw Hill, 2010.
5. Fern Halper, Marcia Kaufman, Bloor Robin and Judith Hurwit, Cloud Computing for Dummies, Wiley India, 2009.

18CS62 SOFTWARE ARCHITECTURE PATTERNS 3 0 0 3

Course Objectives

- Interpret the introductory concepts of Architecture patterns to define the basic characteristics and behavior of a Software application
- Apply the methodologies involved in choosing the best architecture pattern to meet the specific business needs and goals
- Summarize the architecture reconstruction to recover undocumented architectures

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Analyze the characteristics of Layered Architecture Patterns for design consideration
2. Demonstrate the event-driven architecture to produce highly scalable applications
3. Recognize and Classify the microkernel & Microservice architecture pattern based on the custom processing logic
4. Predict the factors of Spacebased architecture to limit application scaling
5. Integrate the functions of views and fusion to reconstruct the software architecture

UNIT I **9 Hours**

LAYERED ARCHITECTURE

Pattern Description - Layered Architecture - Key Concepts - Pattern Example - Considerations - Pattern Analysis - Architectural Considerations

UNIT II **9 Hours**

EVENT-DRIVEN ARCHITECTURE

Introduction of Event-Driven Architecture - Mediator Topology Architecture - Broker Topology Architecture Example - Considerations - Pattern Analysis

UNIT III **10 Hours**

MICROKERNEL

Microkernel Pattern Description - Layered Architecture - Key Concepts - Pattern Example - Considerations - Pattern Analysis - Microservices Description -Pattern Topologies & Analysis

UNIT IV **9 Hours**

SPACE BASED ARCHITECTURE

Introduction to Space Based Architecture - Pattern Description - Pattern Dynamics -Messaging and Data Grid - Considerations - Pattern Analysis

UNIT V **8 Hours**

RECONSTRUCTING SOFTWARE ARCHITECTURES

Uses of Architectural Documentation - Views - Choosing the Relevant Views- Information Extraction - Database Construction - View Fusion -Reconstructions

FOR FURTHER READING

Mirrored, Rack and Farm Architectural Designs

Total: 45 Hours

Reference(s)

1. Mark Richards, Software Architecture Patterns, O'Reilly Media, Third Edition, 2017.
2. Len Bass, Paul Clements, Rick Kazman, Software Architecture in Practice, Second Edition, Pearson, 2013.
3. Peter Eeles, The Process of Software Architecting, Second Edition, Pearson, 2009.
4. Erich Gamma, Design Patterns: Elements of Reusable Object-Oriented Software, First Edition, Pearson, 2011.
5. George H. Fairbanks, Just Enough Software Architecture: A Risk-Driven Approach, First Edition, Marshall & Brainerd, 2010.

18CS63 XML AND WEB SERVICES 3 0 0 3

Course Objectives

- To introduce the basic concepts of XML technology
- To understand the concepts of web services key technologies
- To know the ideas of XML security mechanisms

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Analyze the characteristics of XML technologies to develop Web application
2. Resolve the concepts of Web Services and its Infrastructure based on the business motivation
3. Integrate and develop the knowledge on web services using SOAP, UDDI, WSDL and XML security mechanism
4. Design and implement the XML in various types of E-Business
5. Outline the concept of semantic web with XML content management work flow and web services security

UNIT I **9 Hours**

XML TECHNOLOGY FAMILY

XML -Benefits -Advantages of XML over HTML -EDI -Databases -XML based standards -Structuring with schemas -DTD -XML schemas -XML processing -DOM -SAX -Presentation technologies -XSL -XFORMS -XHTML -Transformation -XSLT -XLINK -XPATH -X query.

UNIT II **10 Hours**

ARCHITECTING WEB SERVICES

Business motivations for web services -B2B -B2C -Technical motivations -Limitations of CORBA and DCOM -Service oriented architecture (SOA) -Architecting web services -Implementation view -Web services technology stack -Logical view -Composition of web services -Deployment view -From application server to peer to peer -Process view -Life in the runtime.

UNIT III **9 Hours**

WEB SERVICES BUILDING BLOCKS

Transport protocols for web services - Messaging with web services - Protocols - SOAP -Describing web services -WSDL -Anatomy of WSDL -Manipulating WSDL -Web service policy-Discovering web services -UDDI -Anatomy of UDDI -Web service inspection -Ad hoc discovery -Securing web services.

UNIT IV **8 Hours**

IMPLEMENTING XML IN E-BUSINESS

B2B -B2C applications -Different types of B2B interaction -Components of e-business XML systems -EBXML -Rosetta net -Applied XML in vertical industry -Web services for mobile devices.

UNIT V **9 Hours**

XML CONTENT MANAGEMENT AND SECURITY

Semantic web -Role of meta data in web content -Resource description framework -RDF schema - Architecture of semantic web -Content management workflow -XLANG -WSFL -Securing web services.

FOR FURTHER READING

Introduction to J2EE-Web services using J2EE.

Total: 45 Hours

Reference(s)

1. Ron Schmelzer&Travis Vandersypen, XML and Web Services Unleashed, Pearson Education, 2012.
2. Keith Ballinger, . NET Web Services Architecture and Implementation, Pearson Education, 2011.
3. H.M.Deitel, P.J.Deitel, T.R.Nieto, T.M.Lin, XML How to Program, Pearson Education,2012.
4. Ramesh Nagappan, Robert Skoczylas and Rima Patel Sriganesh, Developing Java Web Services, Wiley Publishing Inc., 2011.
5. Frank. P. Coyle, XML, Web Services and the Data Revolution, Addison-Wesley Professional, 2002.

18CS64 BIOMETRIC TECHNOLOGIES 3 0 0 3

Course Objectives

- To understand the importance of biometric system in the organization
- To Design a biometric recognition system using facial and finger print recognition technique
- To implement the 3D BIOMETRIC system for security applications

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Analyze the functionalities and applications of Biometric system.
2. Apply the finger print and facial recognition technique for real time application.
3. Design an IRIS recognition system using biometric system.
4. Analyze the functions and applications of behavioral biometric.
5. Implement the 3D BIOMETRIC Technology in their applications.

UNIT I **9 Hours**

INTRODUCTION

Person Recognition -Biometric systems-Biometric functionalities: verification, identification -Biometric systems errors - The design cycle of biometric systems - Applications of Biometric systems -Security and privacy issues.

UNIT II **10 Hours**

FINGER PRINT AND FACIAL RECOGNITION

FINGERPRINT: Introduction -Friction ridge pattern- finger print acquisition: sensing techniques ,image quality -Feature Extraction -matching -indexing -FACE RECOGNITION: Introduction -Image acquisition: 2D sensors, 3D sensors- Face detection- Feature extraction -matching.

UNIT III **9 Hours**

IRIS AND OTHER TRAITS

Design of IRIS recognition system- IRIS segmentation- normalization - encoding and matching- IRIS quality -performance evaluation -other traits- ear detection - ear recognition - gait feature extraction and matching -challenges- hand geometry -soft biometrics.

UNIT IV **9 Hours**

BEHAVIORAL BIOMETRICS

Introduction -Features- classification of behavioral biometrics -properties of behavioral biometrics - signature -keystroke dynamics -voice- merits -demerits -applications- error sources-types -open issues - future trends.

UNIT V **8 Hours**

3D BIOMETRIC

Classification of 3D biometric imaging methods -3D biometric Technologies- 3D palm print capturing systems-3D information in palm print- Feature Extraction from 3D palm print -matching and fusion - security applications.

FOR FURTHER READING

Biometric Security-Residential Biometric Management- Biometric Error Recovery Strategies- Physical Access Control Biometrics.

Total: 45 Hours

Reference(s)

1. Khalid saeed with Marcin Adamski, Tapalina Bhattasali, Mohammed K. Nammous, Piotr panasiuk, mariusz Rybnik and soharab H.Sgaikh, New Directions in Behavioral Biometrics, CRC Press 2017.
2. David Zhang, Guangming Lu, 3D Biometrics Systems and Applications, Springer 2013
3. James wayman, Anil K.Jain, Arun A.Ross, Karthik Nandakumar, Introduction to Biometrics, Springer, 2011
4. Shimon K.Modi, Biometrics in Identity Management: concepts to applications, Artech House 2011
5. John Vacca, Biometrics Technologies and Verification Systems, Elsevier 2007

18CS65 APPLIED CRYPTOGRAPHY 3 0 0 3

Course Objectives

- To analyze the concepts of cryptographic techniques
- To apply the mathematical representation of cryptographic algorithms
- To implement the symmetric and asymmetric encryption algorithms

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Analyze the taxonomy of cryptography primitives
2. Apply the mathematical concepts in cryptography
3. Analyze the usage of random number generators in Encryption and Decryption
4. Apply the Symmetric key and public key encryption techniques
5. Develop Hash algorithms to ensure the authentication

UNIT I **9 Hours**

INTRODUCTION

Cryptography goals -Taxonomy of cryptography primitives -Background on functions -Basic terminology - Block ciphers, stream cipher, substitution ciphers, transposition ciphers -Composition of ciphers -Digital signature -Public key cryptography -Hash functions -Protocol and mechanism -Key establishment and management -Pseudo random numbers -Classes of attack.

UNIT II **9 Hours**

NUMBER THEORY

Probability theory -Information theory- Entropy, Mutual Information- -Complexity theory -Number theory -Abstract algebra -Finite fields -Primality test -Prime number generation -Irreducible polynomial.

UNIT III **9 Hours**

RANDOM GENERATORS

Pseudo random bits and sequences -Random bit generation -Pseudorandom bit generation -ANSI x9.17 Generator -FIPS 186 Generator- statistical tests -Cryptographically secure pseudorandom bit generation - RSA pseudorandom bit generator - Blum-Blum-Shub pseudorandom bit generator.

UNIT IV **9 Hours**

ENCRYPTION ALGORITHMS

Block cipher -DES -Product ciphers and Feistel ciphers - DES algorithm- DES properties and strength- FEAL -IDEA -SAFER -Public key encryption -RSA public key encryption- Description - Security of RSA- RSA encryption in practice -Rabin -Elgamal -Mc Eliece -Knapsack.

UNIT V **9 Hours**

HASH ALGORITHMS

Hash function and data integrity -Classification and framework -Basic constructions and general results - Un keyed hash functions -Keyed hash functions -data integrity and message authentication -Advanced attacks and hash function.

FOR FURTHER READING

Number theory, Analysis of authentication mechanisms, Analysis of modern cryptosystems.

Total: 45 Hours

Reference(s)

1. A.Menezes, P.Van Oorschot and S. Vanstone, Hand book of Applied Cryptography, CRC Press, Fifth Printing, 2001.
2. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security, Private communication in public world, PHI 2nd edition 2002.
3. Bruce Schneier, Neils Ferguson, Practical Cryptography, Wiley Dreamtech India Pvt Ltd, 2003
4. Douglas R Simson, Cryptography -Theory and practice, CRC Press 1995.
5. Stallings, Cryptography & Network Security, Pearson Education, 4th Edition 2006.

18CS66 FOUNDATION OF DATA SCIENCE 3 0 0 3

Course Objectives

- Implement data analytics concepts using R
- Apply the different types of modeling methods for analysis the data

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Analyze the fundamental concepts of data science.
2. Apply fundamental algorithmic ideas to process data.
3. Implement the sentiment analysis approach using R language.
4. Identify the purpose of Map Reduce and HDFS.
5. Apply different types of visualization techniques to predict the future set.

UNIT I **9 Hours**

INTRODUCTION TO DATASCIENCE

Data science process -roles, stages in data science project -working with data from files -working with relational databases -exploring data -managing data -cleaning and sampling for modeling and validation - introduction to NoSQL.

UNIT II **9 Hours**

MODELING METHODS

Choosing and evaluating models -mapping problems to machine learning, evaluating clustering models, validating models -cluster analysis -K-means algorithm, Naive Bayes -Linear and logistic regression.

UNIT III **9 Hours**

INTRODUCTION TO R

Reading and getting data into R -ordered and unordered factors -arrays and matrices -lists and data frames -reading data from files -probability distributions -statistical models in R - manipulating objects -data distribution - Sentiment Analysis Approach -Neutral, Negative, Positive Comparative Analysis –Testing in R-test -Test workflow.

UNIT IV **9 Hours**

MAP REDUCE

Introduction -distributed file system -algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce -Hadoop - Understanding the Map Reduce architecture - Writing Hadoop Map Reduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting - Reducing phase execution

UNIT V **9 Hours**

DELIVERING RESULTS

Documentation and deployment -producing effective presentations -Introduction to graphical analysis - plot() function -displaying multivariate data -matrix plots -Scatter Plot -Histogram - Bar & Stack Bar Chart - Box Plot - Area Chart - Heat Map -Correlogram - Polarity Plot - multiple plots in onewindow - exporting graph - using graphics parameters. Case studies

FOR FURTHER READING
Unsupervised Learning Models -Visualization -HDFS Architecture.

Total: 45 Hours

Reference(s)

1. Boris Lublinsky, Kevin T. Smith and Alexey Yakubovich, Professional Hadoop Solution,Wiley,2015.
2. Nina Zumel and John Mount, Practical Data Science with R, Manning Publications, 2014.
3. Jure Leskovec, Anand Rajaraman and Jeffrey D. Ullman, Mining of Massive Datasets, Cambridge University Press, 2014.
4. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort and Abhijit Dasgupta, Practical Data Science Cookbook, Packt Publishing Ltd., 2014.

18CS67 CONCURRENT PROGRAMMING 2 0 2 3

Course Objectives

- To understand the fundamental concepts of core Java
- To gain conceptual knowledge in Multithreading and Networking concepts
- To design standalone and web applications

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Design real time applications based on core Java Concepts
2. Implement Java Program using Java Regex and Exception Handling Mechanisms.
3. Apply the multithreaded programming concept in multi core environment.
4. Design Graphical User Interface with Java using Java Swing.
5. Create applications to manipulate the data available in databases using database connectivity and Java library.

UNIT I **6 Hours**

JAVA BASICS
Overview of Java-Java Object Class-Operators-Control Statements-Inheritance-Polymorphism-Encapsulation-Array-Object Cloning in Java-Wrapper Class-Java Recursion-Strictfp keyword-javadoc Tool.

UNIT II **7 Hours**

JAVA INPUT AND OUTPUT STREAMS
Java I/O Stream-Types of Streams-File class and its methods- Creating file and folder using Java code-File Output Stream and File Input Stream-File Writer and File Reader-Print Stream and Writer Class-Standard Streams-Buffered Reader and Writer class-Working with File Object-Compressing and Uncompressing File.

UNIT III **6 Hours**

JAVA MULTITHREADING AND NETWORKING

Multithreading in Java-Thread Scheduler-Thread Join-Thread Priority-Daemon Thread in Java-Java Shutdown Hook-Interrupting Thread-Reentrant monitor-Java Socket Programming-Java URL-Java URL Connection Class-Java InetAddress Class-Java Datagram Socket and Datagram Packet.

UNIT IV **5 Hours**

JAVA REGEX, EXCEPTION HANDLING AND JAVA INNER CLASSES

Java Regex API-Java try-catch-Java Multi Catch-Nested try-Java finally block-Java throw-Exception Handling with Method Overriding in Java-Custom Exception-Java Inner Class-Java Member, Local, Anonymous Inner Class-Java Nested Interface.

UNIT V **6 Hours**

JAVA DATABASE PROGRAMMING AND ADVANCED FEATURES

Connecting to Databases -JDBC principles -Transaction Management-Batch Processing-Lambda Expressions-Functional Interfaces-Java Stream-Java Default Methods-Java Collectors-Java StringJoiner-Java Nashorn-Java RMI.

FOR FURTHER READING

Spring framework - Container concepts - DAO Support and JDBC Framework - An introduction to Hibernate 3.5.

1 **3 Hours**

EXPERIMENT 1

Programs using class and methods

2 **3 Hours**

EXPERIMENT 2

Programs using Java Encapsulation, Java Inheritance and Java Polymorphism

3 **3 Hours**

EXPERIMENT 3

Programs using Java Regex Finder

4 **3 Hours**

EXPERIMENT 4

Programs on Java Inner Class and Java Nested Interface

5 **3 Hours**

EXPERIMENT 5

Multi-threaded Programming

6 **4 Hours**

EXPERIMENT 6

Implement a client and server network communication using datagram to send a message from server to client

7 **4 Hours**

EXPERIMENT 7

Desktop applications using Swing

8 **3 Hours**

EXPERIMENT 8

Create a program that works as javap tool

9 **4 Hours**

EXPERIMENT 9

Implementation of JDBC Concepts

Total: 60 Hours

Reference(s)

1. Herbert Schildt., Java: The Complete Reference, Tenth Edition, Tata Mc Graw Hill, 2017
2. Deitel & Deitel., Java How to Program, Prentice Hall of India, 2010
3. Andrey Redko., Java 8 Features, The Ulitmate Guide, Java Code Geeks, 2014
4. John O'Donahue., Java Database Programming Bible, I Edition, Wiley-India, 2002
5. Rod Johnson, Juergen Hoeller, Alef Arendsen, Thomas Risberg, Colin Sampaleanu., Java
6. Development with the Spring Framework, Wiley-India, 2012

18CS68 INTERNET OF THINGS 3 0 0 3

Course Objectives

- Understand the components and protocols used in IOT
- To Understand the IOT Reference Architecture and Real World Design Constraints
- Ability to understand the Security requirements in IOT

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Design an IOT architecture using different types of components and communication models.
2. Select appropriate protocols for specific applications in real time environment.
3. Implement sensor interfacing and collaborate with network devices.
4. Implement IOT programming in cloud and web servers using appropriate protocols..
5. Analyze the security requirements and threats in IOT.

UNIT I **8 Hours**

INTRODUCTION TO INTERNET OF THINGS

IOT Fundamentals - Characteristics of IOT - Physical Design of IOT - IOT Protocols - IOT communication models - IOT Communication APIs -IOT enabled Technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, and Communication protocols, Embedded Systems, IOT Levels and Templates.

UNIT II **10 Hours**

IOT REFERENCE ARCHITECTURE

Introduction- State of the art - Architecture Reference Model- IOT reference Model-IOT Protocols: Zigbee, RFID, BLE, NFC, BACnet, 6LowPAN, RPL, XMPP, CoAP, and MQTT.

UNIT III **9 Hours**

IOT DEVICES AND INTERFACING

IOT components - Sensors - Actuators - Hardware Platforms - Interfacing with devices: Setting up the board - Programming for IOT - Reading from Sensors, Communication: Connecting microcontroller with mobile devices - communication through Bluetooth, wifi, Ethernet.

UNIT IV **9 Hours**

IOT CLOUD, WEB SERVICES AND DATA ANALYTICS

Introduction to Cloud Storage models - Cloud services and IOT - communication APIs -Cloud for IOT - Web server: Web server for IOT - Amazon Web services for IOT- Data analytics for IOT.

UNIT V **9 Hours**

IOT SECURITY

Security Requirements in IOT - Security Concerns in IOT Applications - Security Architecture in the Internet of Things - Insufficient Authentication/Authorization - Insecure Access Control - Threats to Access Control, Privacy, and Availability - Attacks Specific to IOT. Vulnerabilities - Secrecy and Secret-Key Capacity - Authentication/Authorization for Smart Devices - Transport Encryption

FOR FURTHER READING

Securing the Internet of Things Elsevier. Integrating wireless sensor networks with the IOT - case study of intrusion of sensor networks

Total: 45 Hours

Reference(s)

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
2. Vijay Madisetti and ArshdeepBahga, Internet of Things (A Hands-on-Approach), 1stEdition, VPT, 2014.
3. CunoPfister ,Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects) [Kindle Edition] ,2011
4. Brian Russell and Drew Van Duren ,Practical Internet of Things Security (Kindle Edition) ,2016
5. Fei Hu, Security and Privacy in Internet of Things (IOTs): Models, Algorithms, and Implementations,2016

18CS69 5G NETWORKS AND APPLICATIONS 3 0 0 3

Course Objectives

- Impart knowledge in the evolving network configurations and evolutions
- Gain knowledge about the functions of different network layers.
- Familiarize the spectrum requirements used in the present day communication

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Analyze the evolution of internet and resource provisioning
2. Compare the various networking protocols
3. Analyze the protocol stack of 5G architecture
4. Evaluate the need for radio access methodologies for communications
5. Analyze the 5G spectrum requirement in an economic perspective

UNIT I **9 Hours**

DRIVERS FOR 5G

Introduction - Evolution of LTE Technology to Beyond 4G- THE 5G INTERNET Network reconfiguration and Virtualization support - Mobility - quality of Service Control Emerging approach for resource over provisioning

UNIT II **8 Hours**

NEXT GENERATION WIRELESS NETWORKS

Capacity limits and Achievable gains with densification - Mobile data demand - Demand vs Capacity - Co-operation for next generation wireless networks - cooperative diversity and relaying strategies - PHY Layer Impact - MAC protocol analysis.

UNIT III **9 Hours**

5G ARCHITECTURE

Introduction - High level requirements for 5G architecture - Fundamentals architecture and 5G flexibility - Physical Architecture and 5G deployment - Device To Device Communication - D2D from 4G to 5G - Multihop D2D communications for proximity and emergency services - Multi-operator D2D communications.

UNIT IV **10 Hours**

THE 5G RADIO ACCESS METHODOLOGIES

Access design principles for multiuser communications- Multicarrier with filtering a waveform Non orthogonal schemes for efficient multiple access - Radio access for dense deployments - Radio access for V2x communication - Radio access for massive machine type communications.

UNIT V **9 Hours**

SPECTRUM REQUIREMENT ANALYSIS

Introduction - 5G spectrum landscape and requirements - Spectrum access modes and sharing scenarios - 5G spectrum technologies - value of spectrum for 5G a techno - economic perspectives

FOR FURTHER READING

High-speed mobile network- Entertainment and multimedia- Smart Home - Logistics and shipping

Total: 45 Hours

Reference(s)

1. Vincent W. S. Wong, Robert Schober, Key Technologies for 5G Wireless Systems, Cambridge University Press, 2017
2. Hrishikesh Venkataraman, Ramona Trestian , 5G Radio Access Networks: Centralized RAN, Cloud-RAN and Virtualization of Small Cells, by CRC Press , 2017
3. Jose F. Monserrat, Patrick Marsch(ed.), 5G Mobile and Wireless Communications Technology, Cambridge University Press, 2016
4. Fa-Long Luo , Charlie (Jianzhong) Zhang, Signal Processing for 5G: Algorithms and Implementations, Wiley-IEEE Press, 2016
5. Roy Blake, "Wireless Communication Technology", edition 1, Cengage learning. 2012.

18CS70 RESEARCH METHODOLOGY AND IPR 3 0 0 3

Course Objectives

- Understand research problem formulation
- Analyze research related information and follow research ethics
- Understand the importance of IPR

Programme Outcomes (POs)

a. Accomplish research /investigation and development work independently to solve practical problems
b. Write and present a substantial technical report/document
e. Demonstrate independent learning by adopting research pursuits.
f. Possess knowledge for functioning effectively, as a member or team leader, in software projects considering multidisciplinary environments.

Course Outcomes (COs)

1. Identify the research problems and approaches to solve the problems.
2. Develop literature survey, reports and project proposals.
3. Design and develop applications for national and international patents.
4. Summarize the licensing process for patents.
5. Outline the new developments of IPR in different areas of interest.

UNIT I **9 Hours**

INTRODUCTION TO RESEARCH PROBLEM

Meaning of research problem -sources of research problem- criteria-characteristics of a good research problem-errors in selecting a research problem-scope and objectives of research problem-Approaches of investigations of solutions for research problem-Data collection-Analysis-Interpretation-Necessary instrumentations.

UNIT II **9 Hours**

LITERATURE REVIEW, REPORT AND RESEARCH PROPOSAL WRITING

Effective Literature studies-approaches-Analysis-Plagiarism-Research ethics-Effective technical writing-how to write report, paper-Developing a research proposal-Format of a research proposal-a presentation and assessment by a review committee.

UNIT III **9 Hours**

PATENTS AND PROCEDURES

Nature of intellectual property: Patents - Designs -Trade and Copyright-Process of patenting and development: technological research - innovation-patenting - development - international Scenario: International cooperation on Intellectual property-Procedure for grant of patents-patenting under PCT.

UNIT IV **9 Hours**

PATENT RIGHTS

Patent rights-Scope of patent rights-Licensing and transfer of technology-patent information and databases-Geographical indications

UNIT V **9 Hours**

INTELLECTUAL PROPERTY RIGHT(IPR)

New developments in IPR- Administration of patent system-New developments in IPR: IPR of biological systems, Computer software-Traditional knowledge -case studies- IPR and IITs.

FOR FURTHER READING

Sampling:probability and non-probability sampling-Scaling: Thurston, Likert and Guttman scaling.

Total: 45 Hours

Reference(s)

1. Halbert, Resisting Intellectual Property, Taylor & Francis Ltd, 2007.
2. Mayall,Industrial Design, McGraw Hill, 1992.
3. Robert P.Merges, Peter S.Menell, Mark.A.Lemley,Intellectual property in New technological age, 2016
4. T.Ramappa, Intellectual Property Rights under WTO, S.Chand, 2008
5. Niebel,Product Design, McGraw Hill, 1974

OPEN ELECTIVES

18GE01 BUSINESS ANALYTICS 3 0 0 3

Course Objectives

- Understand the role of business analytics within an organization
- Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making
- To become familiar with processes needed to develop, report, and analyze business data
- Use decision-making tools/Operations research techniques and Manage business process using analytical and management tools

Programme Outcomes (POs)

d. Use the techniques, skills, and modern engineering tools, including simulation and modelling for engineering needs.
e. Demonstrate independent learning by adopting research pursuits.

Course Outcomes (COs)

1. Implement the knowledge of data analytics
2. Apply the ability of think critically in making decisions based on data and deep analytics.
3. Analyze the ability to use technical skills in predicative and prescriptive modeling to support business decision-making
4. Determine the ability to translate data into clear, actionable insights
5. Analyze the decision problems in business analytics

UNIT I **9 Hours**

BUSINESS ANALYTICS AND STATISTICAL TOOLS

Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics-Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview

UNIT II **9 Hours**

TRENDINESS AND REGRESSION ANALYSIS

Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology

UNIT III **9 Hours**

ORGANIZATION STRUCTURES OF BUSINESS ANALYTICS

Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization

UNIT IV **9 Hours**

FORECATING TECHNIQUES

Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models

UNIT V **9 Hours**

DECISION ANALYSIS

Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making

FOR FURTHER READING

Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism

Total: 45 Hours

Reference(s)

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press
2. Business Analytics by James Evans, persons Education

18GE02 INDUSTRIAL SAFETY 3 0 0 3

Course Objectives

- To study the principles of safety management system.
- To introduce the provisions contained in the industrial laws.
- To provide knowledge on safety requirements for engineering industry.
- To infer the safety requirement for chemical industry.
- To classify the various safety measures adopted in construction industries.

Course Outcomes (COs)

1. Demonstrate the safety management system of an industry.
2. Implement the provisions if acts and rules in industries.
3. Explain and review the safety performance followed in various industries.
4. Compare the safety appraisal of various industries.
5. Formulate safety reports on construction industries.

UNIT I **9 Hours**

SAFETY MANAGEMENT

Concepts - Evolution, International Labour Organization (ILO), National Safety Council, Techniques - Job Safety Analysis (JSA), Safety survey, Safety inspection, Safety Sampling, Accident Investigation and Reporting - Concept of an accident, Accident causation models, cost of accident, investigation, Safety Performance Monitoring - Safety indices.

UNIT II **9 Hours**

SAFETY AND LAW

Factory Act 1948-Safety and Health chapters, Tamil Nadu Factories Rules- Safety and Health chapters, Environment and Pollution Laws, Building and other construction works act 1996, Motor Vehicle Rules, Explosive Act 1983, Boiler Act.

UNIT III **9 Hours**

SAFETY IN ENGINEERING INDUSTRIES

Safety in metal working machinery and wood working machines, principles, standards and codes - Principles of machine guarding - zero mechanical state (ZMS),types of guards, Personal protective equipments- Safety in handling industrial gases, storage and handling of gas cylinders- Safety in cold forming and hot working of metals- Power press, forging, safety in furnaces, Safety in finishing, inspection and testing, heat treatment, electro plating, leak test, radiography.

UNIT IV **9 Hours**

SAFETY IN CHEMICAL INDUSTRIES

Safety in process design, unit operations, pressure vessel, heat exchanger, safety valves -Plant commissioning and inspection, pressure vessel, non-destructive testing, vibration, corrosion Plant maintenance and emergency planning, management of maintenance HAZOP study, ALOHA, SOFTWARE.

UNIT V **9 Hours**

SAFETY IN CONSTRUCTION INDUSTRY

Causes of fatal accidents, Construction regulations, contractual clauses, permit to work, Quality assurance in construction- Education and training Hazards of construction and prevention- excavation, scaffolding, dismantling, road works, construction of high rise buildings - Working at heights, Occupational Safety and Health Administration (OSHA) requirement for working at heights- Working on fragile roofs, work permit systems- Construction machinery, inspection and testing of cranes, chain pulley blocks, earth moving equipment, conveyors- Manual handling, Safety in demolition work, keys to safe demolition, health hazards from demolition, fire and explosion hazard- Safety in confined spaces.

FOR FURTHER READING

Case Studies- Major accidents at Flixborough, UK, Seveso, Italy, Victoria Dock, India, Bhopal, India.

Total: 45 Hours

Reference(s)

1. R.B.Blake, Industrial Safety, Prentice Hall, Incorporated, New Jersey,1973.
2. National Safety Council, Accident Prevention Manual for Industrial Operations, Chicago, 1988.
3. V.Subramanian, The Factories Act, 1948, with Tamil Nadu Factories Rules , 1950, Madras.
4. Environmental Pollution Control Act, 1986.
5. BOCW Act,1996, Madras Book agency, Chennai-1.
6. Explosive Act, 1884, Eastern Book Company, Lucknow -266 001.

18GE03 OPERATIONS RESEARCH 3 0 0 3

Course Objectives

- To apply the dynamic programming to solve problems of discreet and continuous variables.
- To apply the concept of non-linear programming.
- To carry out sensitivity analysis
- To model the real world problem and simulate it

Course Outcomes (COs)

1. Explain the dynamic programming for discreet and continuous variables.
2. Demonstrate concept of non-linear programming
3. Identify the sensitivity analysis.
4. Formulate the real world problem and simulate it.

UNIT I **9 Hours**

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

UNIT II **9 Hours**

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

UNIT III **9 Hours**

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT IV **9 Hours**

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming

UNIT V **9 Hours**

Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

Total: 45 Hours

Reference(s)

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

18GE04 COST MANAGEMENT OF ENGINEERING PROJECTS

3 0 0 3

Course Objectives

- To apply the decision making in cost management.
- To implement the execution of project and its contracts.
- To analyze cost behavior and profit planning marginal costing
- To apply activity-based cost management
- To explain quantitative techniques for cost management

Course Outcomes (COs)

1. Explain the decision making in cost management.
2. Demonstrate concept of project and its contracts
3. Identify the cost behavior and profit planning marginal costing.
4. Formulate the quantitative techniques for cost management.

UNIT I **9 Hours**

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

UNIT II **9 Hours**

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

UNIT III **9 Hours**

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision- making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints.

UNIT IV **9 Hours**

Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT V **9 Hours**

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Total: 45 Hours

Reference(s)

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting

18GE05 COMPOSITE MATERIALS

3 0 0 3

Course Objectives

- To explain the characteristics of composite materials.
- To implement the particle reinforcements.
- To analyze manufacturing of metal matrix composites
- To apply manufacturing of polymer matrix composites
- To explain strength design and stress concentration

Course Outcomes (COs)

1. Explain the characteristics of composite materials.
2. Demonstrate concept of particle reinforcements
3. Identify the manufacturing of polymer matrix composites .
4. Formulate the strength design and stress concentration.

UNIT I **9 Hours**

Definition – Classification and characteristics of composite materials - Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT II **9 Hours**

Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT III **9 Hours**

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT IV **9 Hours**

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT V **9 Hours**

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria,interacting failure criteria, hygrothermal failure. Laminate first play failure- insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Total: 45 Hours

Reference(s)

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
3. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W.Tasi

18GE06 WASTE TO ENERGY

3 0 0 3

Course Objectives

- To explain the characteristics of energy from waste.
- To implement the Biomass Pyrolysis.
- To analyze manufacturing of Biomass Gasification
- To apply manufacturing of Biomass Combustion
- To explain the properties and application of Biogas

Course Outcomes (COs)

1. Explain the characteristics of energy from waste.
2. Demonstrate concept of Biomass Pyrolysis
3. Identify the manufacturing of Biomass Combustion.
4. Formulate the properties and application of Biogas.

UNIT I **9 Hours**

Introduction to energy from waste: Classification of waste as fuel – Ago based forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors.

UNIT II **9 Hours**

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT III **9 Hours**

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT IV **9 Hours**

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT V **9 Hours**

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Total: 45 Hours

Reference(s)

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd.,1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

AUDIT COURSE I

18XE11 RESEARCH PAPER WRITING 2 0 0 0

Course Objectives

- Understand that how to improve your writing skills and level of readability.
- Learn about what to write in each section.
- Recognise the skills needed when writing a Title.
- Ensure the good quality of paper at very first-time submission.

UNIT I **4 Hours**

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

UNIT II **4 Hours**

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT III **4 Hours**

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT IV **4 Hours**

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

UNIT V **4 Hours**

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

UNIT VI **4 Hours**

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

Total: 24 Hours

Reference(s)

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. HighmanÃ¢??sbook.
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

18XE12 TRADITIONAL TECHNICAL KNOWLEDGE 2 0 0 0

Course Objectives

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world.
- Learning of Sanskrit to improve brain functioning.
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects.
- Enhancing the memory power.
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature.

Course Outcomes (COs)

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

UNIT I **8 Hours**

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences.

UNIT II **8 Hours**

Order, Introduction of roots, Technical information about Sanskrit Literature.

UNIT III **8 Hours**

Technical concepts of Engineering-Electrical, Mechanical,Architecture, Mathematics.

Total: 24 Hours

Reference(s)

1. "Abhyaspustakama" - Dr.Vishwas, Samskrita-Bharti Publication, New Delhi.
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition", Suresh Soni, Ocean books (P) Ltd., New Delhi.

18XE13 VALUE EDUCATION 2 0 0 0

Course Objectives

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Course Outcomes (COs)

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

UNIT I **6 Hours**

Values and self-development-Social values and individual attitudes-Work ethics- Indian vision of humanism- Moral and non- moral valuation-Standards and principles-Value judgements

UNIT II **6 Hours**

Importance of cultivation of values- Sense of duty Devotion- Self-reliance- Confidence-Concentration-Truthfulness- Cleanliness-Honesty- Humanity- Power of faith- National Unity- Patriotism- Love for nature-Discipline

UNIT III **6 Hours**

Personality and Behavior Development - Soul and Scientific attitude- Positive Thinking- Integrity and discipline-Punctuality- Love and Kindness- Avoid fault Thinking- Free from anger- Dignity of labour-Universal brotherhood and religious tolerance-True friendship-Happiness Vs suffering- love for truth-Aware of self-destructive habits-Association and Cooperation-Doing best for saving nature

UNIT IV **6 Hours**

Character and Competence -Holy books vs Blind faith, Self-management and Good health.Science of reincarnation, Equality, Nonviolence ,Humility, Role of Women. All religions and same message, Mind your Mind, Self-control.Honesty, Studying effectively

Total: 24 Hours

Reference(s)

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi.

AUDIT COURSE II

18XE21 STRESS MANAGEMENT 2 0 0 0

Course Objectives

- To achieve overall health of body and mind.
- To overcome stress by practicing yoga

Course Outcomes (COs)

1. Develop healthy mind in a healthy body thus improving social health also.
2. Improve Efficiency of the body by practicing breathing exercises and yoga.

UNIT I **8 Hours**

Definitions of Eight parts of yoga

UNIT II **8 Hours**

Yam and Niyam - Do`s and Don'ts in life - Ahinsa, satya, astheya, bramhacharya and aparigraha - Shaucha, santosh, tapa- swadhyay, ishwarpranidhan

UNIT III **8 Hours**

Asan and Pranayam- Various yog poses and their benefits for mind & body- Regularization of breathing techniques and its effects-Types of pranayam

FURTHER READING

Understanding your stress level Role of personality pattern, Self Esteem, Locus of control Role of thoughts beliefs and emotions, Life situation intrapersonal: (assertiveness, Time management

Total: 24 Hours

Reference(s)

1. Yogic Asanas for Group Training-Part-I Janardan Swami Yogabhyasi Mandal, Nagpur. Model Curriculum of Engineering & Technology PG Courses [Volume-I][47].
2. Rajayoga or conquering the Internal Nature by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata.

18XE22 DISASTER MANAGEMENT 2 0 0 0

Course Objectives

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Course Outcomes (COs)

1. Understanding the key concepts in disaster risk reduction and humanitarian response
2. Understand the strengths and weaknesses of disaster management approaches, planning and programming

UNIT I **5 Hours**

INTRODUCTION

Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT II **5 Hours**

REPERCUSSIONS OF DISASTERS AND HAZARDS

Economic Damage, Loss of Human And Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks of Disease And Epidemics, War And Conflicts.

UNIT III **5 Hours**

DISASTER PRONE AREAS IN INDIA

Study of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

UNIT IV **5 Hours**

DISASTER PREPAREDNESS AND MANAGEMENT

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT V **5 Hours**

RISK ASSESSMENT

Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

UNIT VI **5 Hours**

DISASTER MITIGATION

Disaster Mitigation Meaning, Concept and Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Total: 30 Hours

Reference(s)

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies " , New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi
3. Goel S. L. , "Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.
4. Model Curriculum of Engineering & Technology PG Courses [Volume-I][42]

18XE23 PEDAGOGY STUDIES 2 0 0 0

Course Objectives

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers
- Identify critical evidence gaps to guide the development.

Course Outcomes (COs)

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy overall personality

UNIT I **4 Hours**

Introduction and Methodology Aims and rationale- Policy background- Conceptual framework and terminology-Theories of learning- Curriculum- Teacher education-Conceptual framework- Research questions-Overview of methodology and Searching

UNIT II **2 Hours**

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education

UNIT III **4 Hours**

Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school, curriculum and guidance materials best support effective pedagogy- Theory of change, Strength and nature of the body of evidence for effective pedagogical, practices, Pedagogic theory and pedagogical approaches, Teachers- attitudes and beliefs and Pedagogic strategies.

UNIT IV **4 Hours**

Professional development: alignment with classroom practices and follow up, Support Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT V **2 Hours**

Research gaps and future directions- Research design- Contexts

Total: 16 Hours

Reference(s)

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count International Journal Educational Development, 33 (3): 272-282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, "learning to read" campaign.