M.E. (Software Engineering) 2021 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 **SATHYAMANGALAM - 638401 ERODE DISTRICT TAMILNADU INDIA** Ph : 04295-226000/221289 Fax : 04295-226666 E-mail : stayahead@bitsathy.ac.in Web : www.bitsathy.ac.in

CONTENTS

	Page No.
Regulations	i
Vision of the Department	xvi
Mission of the Department	xvii
PEOs	xviii
POs	xix
Mapping of PEOs and POs	XX
Curriculum 2021	1
Syllabi	4
Electives	24

i

BANNARI AMMAN INSTITUTE OF TECHNOLOGY REGULATIONS 2021 (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) Students admitted under 'Full-Time' should be available in the departments during the entire duration of working hours (from morning to evening on a full-time basis) for the curricular, co-curricular and extra-curricular activities.

The full-time students should not attend any other full-time programme(s) / course(s) or take up any full-time job / part-time job during working hours in any institution or company during the period of the full-time programme. Violation of the above rules will result in the cancellation of admission to the PG programme.

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 will be divided into four 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, these periods being reckoned from the commencement of the first semester to which the candidate was first admitted, regardless of the break-of-study availed.

3. BRANCHES OF STUDY

Following M.E./M.Tech. programmes are offered by the institute

M.E. Programmes

- 1. Communication Systems
- 2. Computer Science and Engineering

ii

- 3. Embedded Systems
- 4. Industrial Automation and Robotics
- 5. Industrial Safety Engineering
- 6. Power Electronics and Drives
- 7. Software Engineering
- 8. Structural Engineering

M. Tech. Programme

9. 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

Program Core Courses (PCC) include the core courses relevant to the chosen specialisation.

Program Elective Courses (PEC) include the elective courses relevant to the chosen specialisation.

Research Methodology and IPR Course to understand the importance and the process of creation of patents through research.

Employability Enhancement Courses (EEC) include project work, practical courses, internship, mini project and industrial/practical training.

Audit Courses (AC) expose the students to Disaster Management, Yoga, English for Research Paper Writing, Value education, Pedagogy Studies, Stress Management, and Personality Development through Life Enlightenment Skills. Registration for anyof these courses is optional to students.

- (ii) Project Work: Every student, individually, shall undertake Dissertation Phase I during the third semester and Dissertation Phase II during the fourth semester under the supervision of a qualified faculty. The project work can be undertaken in an industrial / research organisation or institute in consultation with the faculty guide and the Head of the Department. In the case of project work at an industrial / research organisation, the same shall be jointly supervised by a faculty guide and an expert from the organisation. The student shall be instructed to meet the supervisor periodically and attend the review committee meetings to evaluate the progress.
- (iii) **Elective Courses: Five Elective** courses are offered to the students admitted in various disciplines as prescribed in the curriculum to widen their knowledge in their specialisation 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 six credits. Such students may be exempted

from attending the classes if such course(s) are offered in the semester. Summary of such online courses, taken by the students, along with the offering agency 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 Examinations. 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 Controller of Examinations.

(v) **Industrial Training:** Every full-time student shall take up training in industry/research laboratories, under the supervision of a faculty guide during summer/winter vacation till the pre-final semester of the programme subject to the evaluation prescribed in Clause 15.

If industrial training/internship is not prescribed in the curriculum, the student may undergo industrial training/internship optionally, and the credits earned will be indicated in the Mark Sheet. If the student earns three credits in industrial training/internship, the student may drop one Program Elective in the III semester. In such cases, industrial training/internships need to be undergone continuously from one organisation only. However, if the number of credits earned is 1 or 2, these credits shall not be considered for the classification of the degree. The student is only allowed to undergo a maximum of 6 weeks of industrial training/internship during the entire duration of the study.

Duration Internship	of	Training	/	Credits
2 Weeks				1
4 Weeks				2
6 Weeks				3

- (vi) Mini Project: The students shall undertake a mini project 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 Clause 15.
- (vii)Value Added / Certificate Courses: Students can opt for any one of the value- added courses in II and III semesters, 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 hour of tutorial per week. The exact numbers of credits assigned to the different courses of various programmes are decided by the respective Board 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. Communication Systems	68
2.	M.E. Computer Science and Engineering	68
3.	M.E. Embedded Systems	68
4.	M.E. Industrial Automation and Robotics	68
5.	M.E. Industrial Safety Engineering	68
6.	M.E. Power Electronics and Drives	68
7.	M.E. Software Engineering	68
8.	M.E. Structural Engineering	68
9.	M.Tech. Biotechnology	68

5. COURSE ENROLLMENT AND REGISTRATION

- 5.1 Each student, on admission, shall be assigned to a Faculty Advisor (vide Clause7) who shall advise/counsel the student about the details of the academic programme and the choice of courses considering the student's academicbackground and career objectives.
- 5.2 Every student shall enrol 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 semester II will commence 10 working days prior to the last working day of the semester I. The studentshall confirm the enrolment by registering for the courses within the firstfive working days after the commencement of 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 authorised by the PG coordinator of the programme. In this case, if a student fails in a course, he/she may be permitted to register for 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-enrol 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. Dissertation phase I is to be undertaken during the III semester, and dissertation phase II, which is a continuation of phase I, is to be undertaken during the IV semester. Minimum 24 credits are required to be earned to enrol on dissertation phase I.

If a student fails to earn the requisite minimum credits, the student cannot enrol for dissertation phase I. In such a case, the student can enrol 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 to register for additional courses or drop existing courses. The total number of credits that a student can add or drop is limited to 6, subject to a maximum of 2 courses. In such cases, the attendance requirement as stated in Clause 6is mandatory.

The courses that a student registers in a particular semester may include:

i. Courses of the current semester and

ii. Courses dropped in the lower semesters.

The maximum number of credits that can be registered in a semester is 36. However, this does not include the number of Re-appearance (RA) and Withdrawal (W) courses registered by the student for the appearance of Examination.

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/mini project 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 the 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 the full-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 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 hospitalisation/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 permission to attend the examinations.

- 6.3 A student shall normally be permitted to appear for the end semester examination of a course if the student has satisfied the attendance requirements (vide Clause 6.1-6.2) and has registered for the examination in those courses of that semester by paying the prescribed fee.
- 6.4 A student who does not satisfy clauses 6.1 and 6.2 and secures less than 70% attendance in a course will not be permitted to write the end semester examination. 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 to improve grades/marks.

7. FACULTY ADVISOR

To help students plan their courses of study and for general advice on the academic programme, the Head of the Department of the students will attach a certain number of students to a teacher of the department, who shall function as a faculty advisor for those students throughout their period of study. The faculty advisor shall advise the students in registration and reappearance (Arrear) registration of courses, authorise the process, 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.

The responsibilities of the faculty advisor shall be:

- i. To inform the students about the various facilities and activities available to enhance the student's curricular and co-curricular activities.
- ii. To guide student enrolment and registration of the courses
- iii. To authorise the final registration of the courses at the beginning of each semester.
- iv. To monitor the academic and general performance of the students, including attendance, and to counsel them accordingly.
- v. To collect and maintain the academic and co-curricular records of the students

8. COMMITTEES

8.1 Class Committee Meeting

- i. For all the courses taught, prescribed in the curriculum, a class committee meeting shall be convened twice a semester, comprising faculty members handling all the courses and two student representatives from the class.
- ii. One of the faculty members (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 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, to report 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 timetable circulated by the CoE's Office. 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 needs 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 experts consisting of an internal examiner, usually the supervisor, and an external examiner, appointed by the Controller of the Examination.

A candidate is permitted to register for dissertation phase II only after passing 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 the percentage of total marks secured by a candidate in an individual course as detailed below:

	Grade
Letter Grade	Points
O (Outstanding)	10
A + (Excellent)	9
A (Very Good)	8
B + (Good)	7
B (Above average)	6
C (Satisfactory)	5
RA (Reappearance Registration)	0
I (Incomplete)	0
W (Withdrawal)	0
AB (Absent)	0
SA(Shortage of Attendance)	0

'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:

$$SGPA/CGPA = \frac{\sum_{i=1}^{n} C_{i} * g_{i}}{\sum_{i=1}^{n} C_{i}}$$

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 he/she secures a minimum of 50% of the total mark in the end semester examination of that course.

If a student fails to secure a pass in theory courses and laboratory courses in the current semester examination, he/she is allowed to write arrear examinations for the next three consecutive semesters, and their internal marks shall be carried over for the above mentioned period of three consecutive semesters.

In case if he/she has not completed all the courses of the semester I at the end of semester IV, he/she shall redo the semester I courses along with regular students. The same procedure shall be followed for the subsequent semesters of II, III and IV, subject to the maximum permissible period for this programme.

9.7 If a candidate fails in the end semester examinations of Phase I, he/she has to resubmit the project report within 30 days from the date of declaration of theresults. If he/she fails in the end semester examination of Phase II of M.E. / M.Tech., he/she shall resubmit the project report within 60 days from the date of declaration of the results. The resubmission of the project report and the subsequent viva voce examination will be considered as reappearance with payment of the exam fee. If a student fails to resubmit the project report within the stipulated period and fails in the subsequent viva-voce examination, the student shall register for the course again in the subsequent semester.

10. REJOINING THE PROGRAMME

A candidate who has not completed the study of any of the semesters 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 a case, earlier continuous assessment in the repeated courses will be disregarded. However, no candidate will be allowed to enrol 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 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 THE DEGREE AWARDED

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:

- Should have passed the examination in all the courses of all the four semesters in the student's First Appearance within two years (Three years in case of authorised break of study of one year (if availed)). 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:

- Should have passed the examination in all the courses of all four semesters within three years, including one year of authorised break of study (ifavailed) 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 (not covered in clauses 12.1 and 12.2) who qualify for the award of the degree shall be declared to have passed the examination in the second class.

12.4 A student who is absent in the End Semester Examination in a course/project work after having registered for the same shall be considered to have appeared in that examination (except approved withdrawal from end semester examinations as per clause 13) for the purpose of classification.

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) 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 withdrawal request 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 If a student withdraws a course or courses from writing end semester examinations, he/she shall register the same in the subsequent semester and write the end semester examination(s)
- 13.4 Withdrawal shall not be considered as an appearance for deciding the eligibility of a candidate for first class with distinction or first class.
- 13.5 Withdrawal is permitted for the end semester examinations in the final semester only if the period of study the student concerned does not exceed 3 years for M.E. / M.Tech. as per clauses 12.1 and 12.2.

14. AUTHORISED BREAK OF STUDY FROM A PROGRAMME

- 14.1 A student is permitted to go on a break of study for a fixed period of one year as a single break in the entire course of study.
- 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 the 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 re-join the programme after a break of study/prevention due to lack of attendance shall be governed by the curriculum and regulations in force at the time of re-joining. A committee constituted by the Head of the Institution shall prescribe additional/equivalent courses, if any, from the regulation in force to bridge the requirement between the 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 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 authorised 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

Ι	THEORY COURSESContinuous AssessmentDistribution of marks for Continuous Assessment:Periodical Test I(15)Periodical Test II(15)Term Paper Peport (10) & Presentation (10)	Marks 50
	End Semester Examination Total Marks	50 100
Π	THEORY COURSES WITH LAB COMPONENT Continuous Assessment Distribution of marks for Continuous Assessment: Periodical Test I (15) Periodical Test II (15) Lab Examination (10) Viva-voce (10)	Marks 50
	End Semester Examination (QP pattern as per (I))	50
	Total Marks	100
III	PRACTICAL COURSES Continuous Assessment Distribution of marks for Continuous Assessment: <u>Conduct of Experiment</u> 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)	Marks 100
	Total Marks	100
IV	DISSERTATION PHASE I Continuous Assessment <i>Distribution of marks for Continuous Assessment:</i> <u>Review I</u> <i>Identification of topic and Justification (5)</i>	Marks 50

Literature Survey (5)
<u>Review II</u>
Work plan & Approach (10)
Progress, Results and Discussion (10)
Review III
Conclusion (10)
Implementation & Applications (10)

	End Semester Examination Presentation (20) Report (10) Viva Voce (20)	50
	1 otai Marks	100
V	DISSERTATION PHASE II Continuous Assessment Distribution of marks for Continuous Assessment: <u>Review I</u> Work plan & Approach (10) <u>Review II</u> Progress (10) Results and Discussion (10) <u>Review II</u> Conclusion (10) Implementation & Applications (10)	Marks 50
	End Semester Examination Presentation (20) Report (10) Viva Voce (20) Total Marks	50 100
VI	MINI PROJECT Continuous Assessment Distribution of marks for Continuous Assessment: Review I Review II Presentation & Viva voce Total Marks	Marks 100 25 25 50 100
VII	INDUSTRIAL TRAINING / INTERNSHIP Continuous Assessment Presentation Viva-voce Case study / Report Total Marks	Marks 100 30 30 40 100

VIII	VALUE ADDED COURSES / CERTIFICATE	Marks
	COURSES (Continuous Assessment Only)	

xv

 Test I
 50

 Test II
 50

 Grades: Excellent (>80) / Good (61≤Marks ≤ 80) / Satisfactory (50≤Marks ≤60))

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 (hospitalisation

/ 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.

M.E. – SOFTWARE ENGINEERING

VISION OF THE DEPARTMENT

• To produce competent IT professionals to the dynamic needs of the emerging trends in the field of Information Technology.

MISSION OF THE DEPARTMENT

- 1. To impart technical knowledge through innovative teaching, research and consultancy.
- 2. To adapt to the dynamic needs of industries through curriculum update.
- 3. To produce competent engineers with professional ethics and life skills.

M.E. – SOFTWARE ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- I. Apply principles and practices of software engineering to design software systems that meet global and industrial standards
- II. Incorporate professional, moral, and ethical practices to solve issues in software engineering development and management
- III. Applying research contribution to the growth of the nation and society by adapting Computing, Analytics and soft skills for project development in Software Engineering

PROGRAMME OUTCOMES (POs)

- An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.
- b. An ability to write and present a substantial technical report/document based on the standards.
- c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.
- e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.
- f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

MAPPING OF PEOs AND POs

		PR	OGRAMME	OUTCOME(s)		
PEO's	(a)	(b)	(c)	(d)	(e)	(f)
Ι	Х	Х		Х		Х
п	Х	X	X	Х	X	X
ш	Х	Х	Х	Х	Х	Х

M.E: SOFTWARE ENGINEERING Minimum credits to be earned: 68

First Seme	ster						
Code No.	Course	Objec Outo PEOs	tives & comes POs	L	Т	Р	С
21SE11	RESEARCH METHODOLOGY AND IPR	I,II,III	a,b,c,d,e,f	2	0	0	2
21SE12	ADVANCED DATA STRUCTURES AND ALGORITHMS	I,II,III	c,e,f	3	0	0	3
21SE13	ENTERPRISE SOFTWARE DEVELOPMENT FRAMEWORK	I,II,III	a,b,c,d,e,f	3	0	0	3
21SE14	SOFTWARE ANALYSIS AND DESIGN	I,II,III	a,d,e	3	0	0	3
	PROGRAM ELECTIVE I	-	-	-	-	-	3
21SE16	ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY	I,II,III	c,e,f	0	0	4	2
21SE17	SOFTWARE DESIGN AND DEVELOPMENT LABORATORY	I,II,III	a,b,c,d,e,f	0	0	4	2
	AUDIT COURSE I	-	-	-	-	-	0
			Total	11	0	8	18
Second Sen	nester						
		Objec	tives &				
Code No.	Course	Out	Outcomes		Т	Р	С
		PEOs	POs				
21SE21	SOFTWARE RELIABILITY AND TESTING	I,II,III	a,b,c,d,e,f	3	0	0	3
21SE22	AGILE SOFTWARE DEVELOPMENT	I,II,III	a,b,d,e,f	3	0	0	3
21SE23	ROBOTIC PROCESS AUTOMATION	I,II,III	c,d,e,f	3	0	2	4
	PROGRAM ELECTIVE II	-	-	-	-	-	3
	PROGRAM ELECTIVE III	-	-	-	-	-	3
21SE26	SOFTWARE TESTING LABORATORY	I,II,III	a,b,c,d,f	0	0	4	2
21SE27	MINI PROJECT	-	-	0	0	4	2
	AUDIT COURSE II	-	-	-	-	-	0
			Total	9	0	10	20
Third Sem	ester						
		Objec	tives &				
Code No.	Course	Outo	comes	L	Т	Р	С
		PEOs	POs				
	PROGRAM ELECTIVE IV	-	-	-	-	-	3
	PROGRAM ELECTIVE V	-	-	-	-	-	3
21SE33	DISSERTATION PHASE I	-	-	0	0	20	10
			Total	0	0	20	16
Fourth Sen	nester						
Code No.	Course	Objec Out	Objectives & Outcomes		Т	Р	С
		PEOs	POs				
21SE41	DISSERTATION PHASE II	-	-	0	0	28	14
			Total	0	0	28	14

Electives							
Code No.	Course	Objectives & Outcomes		L	т	Р	С
		PEOs	POs		-	-	Ŭ
Discipline l	Electives	<u>.</u>	·				
21SE51	WIRELESS SENSOR NETWORK	I,II,III	a,c,d,e	3	0	0	3
21SE52	5G NETWORK AND ITS APPLICATION	I,II,III	a,c,d,e	3	0	0	3
21SE53	CYBER SECURITY	I,II,III	a,b,c,d,e,f	3	0	0	3
21SE54	DEVOPS TOOLS AND TECHNOLOGIES	I,II,III	c,e,f	3	0	0	3
21SE55	SOFTWARE REVERSE ENGINEERING	I,II,III	a,b,c,d,e,f	3	0	0	3
21SE56	HUMAN COMPUTER INTERFACE	I,II,III	a,b,c,d,e,f	3	0	0	3
21SE57	DATA SCIENCE USING R	I,II,III	a,b,c,d,e,f	3	0	0	3
21SE58	SOCIAL NETWORK ANALYSIS	I,II,III	a,b,d,e	3	0	0	3
21SE59	MACHINE LEARNING TECHNIQUES	I,II,III	a,b,c,d,e	3	0	0	3
21SE60	DEEP LEARNING	I,II,III	a,b,c,d,e,f	3	0	0	3
21SE61	DIGITAL IMAGE PROCESSING	I,II,III	a,b,d,e,f	3	0	0	3
21SE62	COMPUTER VISION	I,II,III	a,b,d,e,f	3	0	0	3
21SE63	BLOCKCHAIN	I,II,III	a,b,c,d,e,f	3	0	0	3
21SE64	DESIGN OF ENTERPRISE SOFTWARE SYSTEMS	I,II,III	a,b,c,d,e,f	3	0	0	3
21SE65	ENTERPRISE SYSTEMS SECURITY AND FORENSICS	I,II,III	a,d,f	3	0	0	3
21SE66	CLOUD INFRASTRUCTURE MANAGEMENT SYSTEMS	I,II,III	a,b,c,d,e,f	3	0	0	3
21SE67	NATURAL LANGUAGE PROCESSING	I,II,III	a,b,c,d,e	3	0	0	3
List of Aud	lit courses I & II				- -	- -	
21XE01	ENGLISH FOR RESEARCH PAPER WRITING	-	-	2	0	0	0
21XE02	COST MANAGEMENT OF ENGINEERING PROJECTS	-	-	2	0	0	0
21XE03	STRESS MANAGEMENT	-	-	2	0	0	0
21XE04	DISASTER MANAGEMENT	-	-	2	0	0	0
21XE05	VALUE EDUCATION	-	-	2	0	0	0
21XE06	PEDAGOGY STUDIES	-	-	2	0	0	0
21XE07	BUSINESS ANALYTICS	-	-	2	0	0	0

21SE11 RESEARCH METHODOLOGY AND IPR 2002

Course Objectives

- Understand the techniques for research problem formulation, analysis and solution.
- Analyze research related information and follow research ethics in technical paper writing/presentation.
- Gain knowledge about Patent drafting and filing patents.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Formulate the research problems and identify the approaches to solve the problems.
- 2. Analyze literature survey and prepare reports based on research ethics
- 3. Develop research proposals and apply assessment procedures to review
- 4. Develop patents using the IPR & PCT guidelines
- 5. Adapt the licensing process for patents and analyse the developments of IPR

UNIT I

INTRODUCTION TO RESEARCH PROBLEM

Meaning of research problem -Sources of research problem-criteria characteristics of a good research problemerrors 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

LITERATURE REVIEW

Effective Literature studies approaches-analysis-Plagiarism-Research ethics- Review of the literature, searching the existing literature, reviewing the selected literature, developing a theoretical framework, developing a conceptual framework, writing about the literature reviewed.

UNIT III

TECHNICAL WRITING/PRESENTATION

Effective technical writing-how to write report-paper-Developing a research proposal-Format of Research proposal-a presentation and assessment by a review committee

6 Hours

6 Hours

6 Hours

4

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021

UNIT IV

INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS(IPR)

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 Patents, Patenting under Patent Cooperation Treaty(PCT).

UNIT V

INTELLECTUAL PROPERTY RIGHT(IPR)

Patent Rights: Scope of Patent Rights, Licensing and transfer of Technology, Patent information and databases-Geographical Indications. New Developments in IPR: Administration of Patent system, IPR of Biological systems, Computer Software-Traditional knowledge -case studies.

FURTHER READING

Sampling: probability and non-probability sampling-Scaling: Thurston, Likert and Guttman scaling-Simulation based research methods

Reference(s)

- 1. C.R.Kothari , Gaurav Garg, Research Methodology Methods and Techniques, 4th Edition, New Age International Publishers, 2018.
- 2. Wayne Goddard and Stuart Melville, Research methodology An Introduction,2nd Edition, Juta and Company Ltd, 2007
- 3. Halbert, Resisting Intellectual Property, Taylor & Francis Ltd, 2007
- 4. Robert P.Merges, Peter S.Menell, Mark.A.Lemley, Intellectual property in New technological age, 2016
- 5. T.Ramappa, Intellectual Property Rights under WTO, S.Chand, 2008
- 6. Ranjit Kumar, 2nd Edition, Research Methodology A Step by Step Guide for beginners 2010

21SE12 ADVANCED DATA STRUCTURES AND ALGORITHMS 3003

Course Objectives

- Apply the various algorithms for applications involving probability and statistics in computing (data analytics)
- Evaluate and Perform hypothesis testing and to conclude the result for NP Complete problems.
- Design and build solutions for a real world problem by applying relevant algorithms.

Programme Outcomes (POs)

c. Students should be 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. e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Analyze the role of algorithms in computing and measure the efficiency
- 2. Design an algorithm for a specific problem using appropriate ADT"s.
- 3. Apply algorithm design approaches in problem specific manner.

6 Hours

6 Hours

Total: 30 Hours

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021

- 4. Implement appropriate mathematical abstraction to solve problems.
- 5. Develop applications that solves NP complete problems

UNIT I

ALGORITHM ANALYSIS

Algorithm Analysis: Asymptotic Notation-Standard - Recurrences - Solution to Recurrences Randomized Algorithms- Randomized Ouicksort, Analysis of Hashing algorithms. Algorithm Analysis Techniques -Amortized Analysis.

UNIT II

ABSTRACT DATA TYPES

External Memory ADT - B-Trees. Priority Queues and Their Extensions: Binomial heaps, Fibonacci heaps, applications to Shortest Path Algorithms. Partition ADT: Weighted union, path compression, Applications to MST.

UNIT III

ALGORITHM DESIGN TECHNIOUES

Dynamic Programming-Bellman-Ford, Greedy Algorithms. Network Flows-Max flow, min-cut theorem, Ford-Fulkerson, Edmonds-Karp algorithm, Bipartite Matching.

UNIT IV

AMORTIZED ANALYSIS AND STRING MATCHING ALGORITHMS

Aggregate Method - Accounting Method - Potential Method. String Matching Algorithms: KMP, Aho-Korasik algorithm, Z-algorithm.

UNIT V

NP-COMPLETENESS AND REDUCTIONS

NP Completeness - Cook Levine Theorem - Important NP Complete Problems - Reduction of standard NP Complete Problems (SAT, 3SAT, Clique, Vertex Cover, Set Cover, Hamiltonian Cvcle).

FOR FURTHER READING

Approximation algorithms for known NP hard problems - In approximability.

Reference(s)

- 1. S. Dasgupta, C. Papadimitrou, U Vazirani, Algorithms, McGrawHill., 2017.
- 2. J. Klienberg and E. Tardos, Algorithm Design, Pearson Education, 2013.
- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, 3. Third Edition, Prentice-Hall, 2011
- 4. Michael T Goodric and Roberto Tamassia, Algorithm Design: Foundations, Analysis and Internet Examples, John Wiley and Sons, 2002.

10 Hours

9 Hours

9 Hours

9 Hours

8 Hours

Total: 45 Hours

21SE13 ENTERPRISE SOFTWARE
DEVELOPMENT FRAMEWORK3003

Course Objectives

- Acquaint the basic principles of organization and operation of enterprise-scale software development.
- Understand the state-of-the-art models, methodologies, and technologies used for enterprise-scale software system development
- Apply the current IDEs, intended for practical enterprise-scale software system development in teambased, interactive conditions.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Interpret the fundamental properties of components, technology, architecture and middleware.
- 2. Develop an application that provides business solutions using EJB (System level services)
- 3. Design a framework to deploy servlet and JSP applications using MVC architecture
- 4. Design a Java application exploring Spring and Hibernate modules and architecture.
- 5. Design a.net framework based application to deploy .net based enterprise software.

UNIT I

INTRODUCTION

Software components, Objects, Modules, Interfaces, Callbacks, Directory Services, Component Architecture-Disciplines, Perspectives, and Requirements, Component and Middleware

UNIT II

ENTERPRISE JAVA BEAN

Architecture, Component type-Session and Entity beans, Container services, Stateless session bean, Stateful Session bean, Singleton Session Beans, Message Driven Beans, EJB and Persistance, JPA QL, Entity Callbacks, and Listeners.

UNIT III

STRUTS

STRUT Framework- Architecture, Components, Actions, ActionForms, Configuring Struts and Building Struts enabled JSP, Struct Custom Tag Libraries, Internationalization, Struts Packages and Extensions, Tiles and Validator.

9 Hours

9 Hours

9 Hours

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021

UNIT IV

SPRING AND HIBERNATE

Set up Routine Foran Enterprise Spring Application, Micro Service Architecture with Spring MVC, Spring JDBC, Hibernate Architecture, Hibernate Web Application, Inheritance Mapping, Collection Mapping, Association Mapping, Hibernate Caching, Integrating with Struts and Spring

UNIT V

.NET ENTERPRISE SERVICES

Introducing .NET Enterprise Services, Object Activation and Context, Concurrency,COM Interop, Networking and Data access, Transaction Services

FURTHER READING

JAKARTA Enterprise Javabeans, Future oF Enterprise Distributed Applications

Reference(s)

- 1. Clemens Szyperski, Component Software Beyond Object-Oriented Programming, Pearson Education Publishers, 2011.
- 2. Jonathan Wetherbee, Raghu Kodali, Chirag Rathod, Peter Zadrozny, Beginning EJB 3, Apress, 2018.
- 3. J. Scott Stanlick ,Spring Next Generation Aspect Oriented Programming, CreateSpace Independent Publishing Platform ,2019
- 4. Alex Bretet, Spring MVC Cookbook, Packt Publishing Ltd., Feb 2016. Christian Bauer, Gavin King, Java Persistance with Hibernate, Dreamtech Press, Nov 2015.
- 5. Christian Nagel, Enterprise Services with .NET framework, Addison Wesley, 2015.

21SE14 SOFTWARE ANALYSIS AND DESIGN 3003

Course Objectives

- Interpret the software life cycle models in the development of projects.
- Design a reliable project by gathering the requirements and allow it to work in cross functional mode.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. Design a solution to a given problem using common lifecycle processes.
- 2. Construct a data flow diagram which demonstrates the software requirements and formal specifications of the software systems.
- 3. Implement the design strategies and models for building real time systems.
- 4. Design and motivate software architecture for large-scale software systems.
- 5. Exemplify software design patterns to validate the software design.

9 Hours

9 Hours

Total: 45 Hours

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021

UNIT I

SDLC MODELS

Software Engineering Concepts- Development Activities- Software Lifecycle Models: Classical Waterfall Model-V-Model - Incremental Model-Spiral Model-WINWIN Spiral Model-Prototyping Model- Evolutionary Model - Concurrent Model- RAD Model- Agile Model- Specialized Process Model: Component Based Development- Formal Methods Model- Aspect Oriented Software Development. Unified Process Model.

UNIT II

SOFTWARE REQUIREMNT SPECIFICATION

Requirement Analysis and Specification- Requirement Gathering and Analysis- Software Requirement Specification- Formal System Specification-Data Modelling: ER Diagram- Functional Modelling: Data Floe Diagram- Behavioral Modelling: State Transition Diagram- Scenario Based Modelling- UML Model- Class Responsibility Modelling.

UNIT III

DESIGN STRATEGIES AND MODELS

Design Strategies: Top down and Bottom up- Organizational Methods and Design- Jackson Structured Programming - Jackson System Development. Design Models: Object- based Design and Structured System Analysis and Structured Design Method- Traditional Approach to Design - SADT Organization Design Practices - SSADM and Design for Real Time Systems.

UNIT IV

SOFTWARE ARCHITECTURE

Software Architecture- Definition Prospects- State of Art- Architectural Styles - Pipes and Filters - Layered Systems-Repositories- Process Control, Other Familiar Architecture Heterogeneous Architectures. Architecture Design- Introduction shared Information System, Architecture Structures for Shared Information Systems, Architecture Design Guidance- User Interface Architecture.

UNIT V

SOFTWARE ARCHITECTURE PATTERNS

Introduction to Design Pattern Architectural Design and Mapping- Description of Various Architectural Design Patterns- Emerging Trends in Architecture and Design- Tools for Architectural Design Exploiting Style in Architectural Design- Architectural Interconnection.

FOR FURTHER READING

Web App Design Model, Mobile App Design Model

Reference(s)

- 1. Roger S. Pressman, Bruce R. Maxin, Software Engineering- A Practitioner's Approach, Tata McGraw Hill Education, Eighth Edition(2019 Reprint)
- 2. Roger S. Pressman, Software Engineering- A Practitioner"s Approach, Tata McGraw Hill Education, Eighth Edition(2019 Reprint)
- Ian Sommerville, Software Engineering, 9th Edition, 2011(Reprint) 3.
- 4. James F. Peters, Witold Pedrycz, Software Engineering: An Engineering Approach, John Wiley & Sons Inc, 9th Edition, 2000(Reprint)
- 5. Grady Booch Robert A, Maksimchuk Michael W, Engle Bobbi J, Young, Ph.D, Jim Conallen Kelli A. Houston, Object Oriented Analysis and Design with Applications, Addison-Wesley, Third Edition, 2007.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

Total: 45 Hours

21SE16 ADVANCED DATA STRUCTURES AND 0042 ALGORITHMS LABORATORY

Course Objectives

- Design data structures and algorithms to solve computing problems •
- Design algorithms using graph structure and various string matching algorithms to solve a practical application
- Apply suitable design strategy for problem solving

Programme Outcomes (POs)

c. Students should be 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. e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Implement the sorting algorithm using java
- 2. Develop applications using hierarchical data structures using java
- 3. Implement graph algorithms to solve network related problems using java
- 4. Implement the Problem Elements of the Greedy Strategy and Huffman Coding algorithm using java.
- 5. Develop applications that solves NP complete problems using java

1 EXPERIMENT 1 Implement the Merge Sort and Quick Sort-Algorithms.	5 Hours
2 EXPERIMENT 2 Implement the Binary Search Tree	6 Hours
3 EXPERIMENT 3 Implement the Red-Black Tree	5 Hours
4 EXPERIMENT 4 Implement the Heap Implementation	5 Hours
5 EXPERIMENT 5 Implement the Eihennessi Heen Implementation	5 Hours

Implement the Fibonacci Heap Implementation

6 EXPERIMENT 6 Implement the Graph Traversals	6 Hours
7 EXPERIMENT 7 Implement the Spanning Tree Implementation	6 Hours
8 EXPERIMENT 8 Implement the Shortest Path Algorithms (Dijkstra's algorithm, Bellmann Ford Algorithm)	5 Hours
9 EXPERIMENT 9 Implement the Matrix Chain Multiplication	6 Hours
10 EXPERIMENT 10 Implement the Activity Selection and Huffman Coding Implementation	6 Hours
11 EXPERIMENT 11 Implement the Travelling Salesman Problem	5 Hours Total: 60 Hours

21SE17 SOFTWARE DESIGN AND
DEVELOPMENT LABORATORY0 0 4 2

Course Objectives

- To provide a deep insight into the importance of project planning in the software industry
- To understand the software life cycle phases (Project Management, Requirements Engineering, Software Design and Testing) and to get familiar with the usage of CASE tools and Unified Modeling Language (UML)
- The Software Project Development will facilitate the students to develop a preliminary yet practical understanding of software development process and tools

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating

software engineering models.

Course Outcomes (COs)

- 1. Understand the basics of software engineering, processes, models and practices
- 2. Understand software requirement engineering and its application using various models
- 3. Analyze risk factors, risk identification, risk projection, Risk refinement, risk management and dealing with change management, survey few tools for configuration management
- 4. Apply testing and its theoretical background along with metrics to test source code, applications and maintenance of application

1

OVERVIEW ABOUT SCRUM PROCESS

-Use open source tools to prepare an agile road map and apply the agile scrum framework and deploy the projects

-Create User stories and issues, plan sprints and distribute tasks across your software team

-Prioritize and discuss your team's work in full context with complete visibility

-Enrich with confidence and sanity knowing the information you have is always up-to date

-Improve team performance based on real-time, visual data that your team can put to use

2	6 Hours
EXPERIMENT 2	
Airline Reservation System	
3	6 Hours
EXPERIMENT 3	
Post Office Management System	
4	6 Hours
EXPERIMENT 4	
Online Polling System Project	
5	6 Hours
EXPERIMENT 5	
Power Billing System Project Report	
6	6 Hours
EXPERIMENT 6	0
Stock Management System	
7	6 Hours
EXPERIMENT 7	0 110 ul b
Crime Records Management System	
8	6 Hours
EXPERIMENT 8	- IIU
E-Bus pass Registration And Renewal System Project	

6 Hours

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021

9

EXPERIMENT 9

Smart Card-One Nation One Ration Card

10

EXPERIMENT 10

Mobile grocery stores

21SE21 SOFTWARE RELIABILITY AND TESTING 3003

Course Objectives

- To gain basic knowledge about metrics, measurement theory and related terminologies •
- To learn measure the quality level of internal and external attributes of the software product •
- To introduce the basics of software reliability and to illustrate how to perform planning, executing and testing for software reliability
- To explore various metrics and models of software reliability
- To compare various models of software reliability based on its application •

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Identify various software metrics, which determines the quality level of software.
- 2. Compare and Pick out the right reliability model for evaluating the software.
- 3. Design new metrics and reliability models for evaluating the quality level of the software based on the requirement.
- 4. Evaluate the quality level of internal and external attributes of the software product.
- 5. Evaluate the reliability of any given software product.

UNIT I

SYSTEM RELIABILITY

Review of Reliability Mathematics - Reliability Block diagram- System Reliability- Repairable and Non Repairable systems- Maintainability and Availability- MTBF- MTTF- MDT- MTTR- Designing for higher reliability-Redundancy-k out of n systems.

9 Hours

Total: 60 Hours

6 Hours

6 Hours

Syllabi: M.E. Software Engineering| Minimum Credits to be earned: 68| Regulations 2021

UNIT II

EVOLUTION OF SOFTWARE RELIABILITY MODELS

Basic Concepts:Software vs Hardware Reliability-Failure and Faults-Introduction to Software Reliability Growth Models (SRGMs)-General Model Characteristic- Model Classification scheme-white box and black box models-models for application during operational phase and testing phase-Okumoto imperfect debugging model

UNIT III

NONHOMOGENEOUS POISSON PROCESS (NHPP) MODELS

Stochastic process-Counting Process-Execution time-Testing time and Calendar Time modeling-Musa models-Basic Execution time-Okumoto Logarithmic Poisson Execution time models-NHPP models - Yamada delayed S-shaped model.

UNIT IV

FLEXIBLE AND QUALITY METRICS PRODUCING MODELS

Flexible models- Kapur- Garg model, Subburaj-Gopal model for the learning phenomenon, Subburaj-Gopal-Kapur versatile debugging model -Failure Data-Parameter estimation-Use of tools - Predictive Validity of Models:short term and long term

UNIT V

COMPARISON OF SOFTWARE RELIABILITY MODELING

Bayesian models-Littlewood-Verrall model-Discrete models-Efforts based models;Execution time-Testing time and Release Time determination-cost-failure intensity-reliability-Comparison Criteria: Goodness of fit-Predictive Validity of Models-short term and long term

FOR FURTHER READING

CASRE software:Creating the failure data file for CASRE- Executing CASRE - Executing CASRE with Excel to obtain FI/FIO Plots - Interpreting CASRE results.

Reference(s)

- 1. Dr.R.Subburaj, "Software Reliability Engineering", McGrawHill Education, 2015
- 2. Fatemeh Afsharnia (2017). Failure Rate Analysis, Failure Analysis and Prevention, Aidy Ali, IntechOpen, DOI: 10.5772/intechopen.71849. Available from: <u>https://www.intechopen.com/books/failure-analysis-</u>and-prevention/failure-rate-analysis.
- 3. Patric D.T.O Connor,"Practical Reliability Engineering",5th Edition, John Wesley&sons,2012
- 4. P.K.Kapur,H.Pham,A.Gupta,P.C.Jha,"Software Reliability Assessment with OR Applications",Springer 2011
- 5. John D.Musa, Anthony Iannino, Kazuhira Okumoto, "Software Reliability-Measurement, Prediction, Application, Series in Software Engineering and Technology", McGrawHill, 1987
- 6. Michael Lyu, "Handbook of Software Reliability Engineering", IEEE Computer Society Press, ISBN:0-07-039400-8,2005

9 Hours

9 Hours

9 Hours

9 Hours

Total: 45 Hours

21SE22 AGILE SOFTWARE DEVELOPMENT 3003

Course Objectives

- To provide students with a theoretical as well as practical understanding of agile software development practices
- To understand the Agile Scrum framework and development practices.
- To apply software design principles and refactoring techniques to achieve agility.
- To understand Agile testing methodologies and perform testing activities within an agile project.
- To understand the benefits and pitfalls of working in an Agile team in terms of quality assurance.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand genesis of Agile and driving forces for choosing Agile techniques
- 2. Apply the Agile Scrum framework and development practices.
- 3. Apply iterative software development processes by planning and executing them.
- 4. Analyse the impact of the success of social aspects behind the software testing.
- 5. Analyze techniques and tools for improving team collaboration and management.

UNIT I

AGILE METHODOLOGY

Agility and the Cost of Change, Agility Principles, The Politics of Agile Development, Extreme Programming, The XP Process, Twelve Practices of XP, Industrial XP, Other Agile Process Models, Scrum, Dynamic Systems Development Method, Agile Modeling, Agile Unified Process, A Tool Set for the Agile Process

UNIT II

AGILE SCRUM FRAMEWORK

Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles, Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management.

UNIT III

AGILE SOFTWARE DESIGN AND DEVELOPMENT

Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control.

9 Hours

9 Hours

9 Hours
UNIT IV

AGILE TESTING

The Agile lifecycle and its impact on testing, Test Driven Development (TDD), Testing user stories, Acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester.

UNIT V

TOOLS FOR AGILE PROJECT MANAGEMENT

Specialized agile software, practical implications: Expense structure, staff issues, market implications. Extended agile case study: Implementation, Tracking Program, Support from management, Scaling the budget and refining the process.

FURTHER READING

Case Study: The weather station case study, The payroll case study and the ETS case study

Total: 45 Hours

Reference(s)

1. Ken Schwaber, Mike Beedle, Agile Software Development with Scrum, Pearson, 2014.

- 2. Robert C. Martin, Agile Software Development, Principles, Patterns and Practices Pearson, First Edition 2013.
- 3. Lisa Crispin, Janet Gregory, Agile Testing: A Practical Guide for Testers and Agile Teams Addison Wesley, 2010.
- 4. Roger S Pressman, Software Engineering: A Practitioner Approach, Tata McGraw Hill, Eighth Edition, 2015
- 5. Ed Stark Agile Project Management: QuickStart Guide A Simplified Beginners Guide To Agile Project, Second Edition , by ClydeBank Business - 2017
- 6. Craig Larman, Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2016.

21SE23 ROBOTIC PROCESS AUTOMATION 3 0 2 4

Course Objectives

- Understand the concept of software automation of the day to day activities performed using RPA Tools.
- Perform analysis on the information retrieved from various sources that fits the requirement of the application.

Programme Outcomes (POs)

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

1. Understand the basic principles of software automation and different types of applications that are integrated with automation.

9 Hours

2. Develop applications based on various Planning and process methodology to automate the tasks that are to be performed repeatedly.

3. Develop a software BOT with integration with different input sources based on the process requirement.

4. Apply debugging and exception handling techniques to perform application without error during the execution.

5. Apply BOT Insight to implement the artificial intelligence techniques in software automation.

UNIT I

RPA FOUNDATION

RPA: History, Benefits, Comparison - RPA Skills: On-Premise Vs Cloud, Web Technology, Optical Character Recognition, Databases, Application Programming Interfaces.

UNIT II

PROCESS METHODOLOGY AND PLANNING

Lean - Six Sigma - Implementation of Six Sigma - Roles and Levels in Six Sigma - Lean Six Sigma - Applying Lean and Six sigma in RPA - Planning: ROI for RPI, Use Cases of RPA.

UNIT III

BOT DEVELOPMENT

Introduction - Recorders - Smart Recorders - Web Recorders - Screen Recorders - Task Editor - Variables -Command Library - Loop Command - Excel Command - Database Command - String Operation Command -XML Command - Terminal Emulator Command - PDF Integration Command - FTP Command - PGP Command - Object Cloning Command.

UNIT IV

EXCEPTION HANDLING, DEBUGGING AND LOGGING

Assistant bots: Monitoring system event triggers, Monitoring image and element triggers - Exception handling - Exception handling Commands - Logging - Debugging techniques - Collecting crash dumps - Error reporting.

UNIT V

META BOT AND BOT INSIGHT

Introduction - MetaBot Designer - MetaBot With AI Sense - Bot Insight - Transactional Analytics - Operational Analytics - Course Key Points.

FOR FURTHER READING

Deploying and Maintaining the BoT - Orchestration Server - Orchestration Server to control bots - License management - Publishing.

1

EXPERIMENT 1

Software Installation Procedure - Installation of AA Control Room, SQL Server and AA Client

2

EXPERIMENT 2

Bot Creation using recorders (Smart, Web and Screen)

6 Hours

9 Hours

12 Hours

9 Hours

9 Hours

3 Hours

3 EXPERIMENT 3 Bot Creation using command library - (Loop Command)	3 Hours
4 EXPERIMENT 4 Bot Creation to invoke database automation	3 Hours
5 EXPERIMENT 5 Bot Creation for automating excel operations	3 Hours
6 EXPERIMENT 6 Bot Creation for PDF Integrations	3 Hours
7 EXPERIMENT 7 Bot Creation and working on error handling	3 Hours
8 EXPERIMENT 8 Bot Development using Object Cloning Command	3 Hours
9 EXPERIMENT 9 FTP and PGB Command Execution by Bots	3 Hours
10 EXPERIMENT 10 MetaBot Designing with AI Sense	3 Hours
Reference (s)	Total: 75 Hours
 Alok Mani Tripathi, Learning Robotic Process Automation UiPath Kindle Edition, 2018 Tom Taulli, Robotic Process Automation Handbook, Kindle Edition, 2020. Richard Murdoch, Robotic Process Automation, 2018. Mary C. Lacity and Leslie P. Willcocks, Robotic Process and Cognitive Automation 20 	3.

5. Lim Mei Ying, Robotic Process Automation with Blue Prism Quick, 2018.

21SE26 SOFTWARE TESTING LABORATORY

Course Objectives

• To apply different design techniques, testing strategies and automate the testing process as a part of developing and deploying software based on software life cycle model.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Apply UML model elements to enable visual representation of the system being developed
- 2. Apply various testing methodologies to design and execute test cases for the problems solved using programming language.
- 3. Apply testing tools to automate various testing methodologies on web application.

1

ER DIAGRAM

Develop an ER diagram for any real time application

2

UML BEHAVIORAL DIAGRAMS

Deploy UML diagrams - Use Case diagram - Sequence Diagram - State chart Diagram - Collaboration Diagram - Activity Diagram for any two real time applications

3

UML STRUCTURAL DIAGRAMS

Deploy UML diagrams - Class diagram - Component Diagram and Deployment Diagram for any two real time applications

4

TEST CASES DESIGN

a. Design, develop, code and run the program in any suitable language to implement the quick sort algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.

b. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on equivalence class partitioning, execute the test cases and discuss the results.

19

12 Hours

12 Hours

12 Hours

0042

5

TESTING TOOLS

a. Automate 'User Registration' of any E-commerce Website using Selenium Tool

b. Automate GUI Testing for any E-commerce Website using Selenium Tool

c. Implement Whitebox testing and code coverage methods such as Statement Coverage, Decision Coverage and Branch Coverage for any program using CodeCover Tool

Total: 60 Hours

21SE51 WIRELESS SENSOR NETWORK 3003

Course Objectives

- Learn various fundamental and emerging protocols of all layers
- Explore the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks
- Understand the nature and applications of Ad-hoc and sensor networks
- Enrich various security practices and protocols of Ad-hoc and Sensor Networks

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. Infer the implications of MAC and TCP protocols designed for wired and wireless ad-hoc/sensor networks
- 2. Infer various network layer protocol design issues of wireless sensor and ad-hoc networks.
- 3. Analyze current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks by considering reference model.
- 4. Apply various defense techniques for the security threats of ad-hoc and sensor networks.
- 5. Implement real-time applications in NS3/SciLab/TinyOS environment and compute various parameters associated with it.

UNIT I

ADHOC NETWORKS FUNDAMENTALS AND MAC PROTOCOLS

Fundamentals of WLANs - Self Configuration and Auto Configuration 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

ADHOC NETWORK ROUTING AND MANAGEMENT

Routing in Ad-Hoc Networks- 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

UNIT III

SENSOR NETWORK FUNDAMENTALS

Introduction - Architecture - Single Node Architecture - Sensor Network Design Considerations - Protocols for WSN- Physical Layer - Transceiver Design Considerations - IEEE 802.15.4 Zigbee - Link Layer and ErrorControl Issues - Routing Protocols - Mobile Nodes and Mobile Robots - Data Centric routing - Transport Protocols - Congestion Control Issues - Application Layer Support

UNIT IV

ADHOC 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 - Broadcast Authentication WSN Protocols - TESLA - Biba - Sensor Network Security Protocols - SPINS

UNIT V

SENSOR NETWORK MANAGEMENT AND PROGRAMMING

Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols -TimeSynchronization - QoS - Localization and Positioning - Operating Systems and Sensor Network Programming - Sensor Network Simulators NS3 - Scilab

FOR FURTHER READING

WSN	Network	Architecture,WSN	routing,OLSR,Localization,
Indoor and sensor Network Localization			

Reference(s)

- Carlos De MoraisCordeiro, Dharma Prakash Agrawal, "AdHoc and Sensor Networks Theoryand 1. Applications", Second Edition, World Scientific Publishing, 2011.
- 2. Holger Karl, Andreas willig, "Protocols and Architectures for Wireless Sensor Networks", JohnWiley & Sons, Inc .2007
- C.Siva Ram Murthy and B.S.Manoj, "AdHoc Wireless Networks Architectures and Protocols", Pearson 3. Education, 2018
- C.K.Toh, "AdHoc Mobile Wireless Networks", Pearson Education, 2002 4.
- Erdal Cayirci, ChunmingRong, "Security in Wireless Ad Hoc and Sensor Networks", JohnWiley and 5. Sons, 2009
- 6. WaltenegusDargie, Christian Poellabauer, "Fundamentals of Wireless Sensor NetworksTheory and Practice", John Wiley and Sons, 2010

9 Hours

9 Hours

9 Hours

9 Hours

21SE52 5G NETWORK AND ITS APPLICATION 3003

Course Objectives

- Learn various techniques for High resolution and bi-directional large bandwidth shaping
- Explore the issues pertaining to gather all networks on one platform
- Understand the nature and applications of technological sound to support heterogeneous services (including private network).
- Enrich various security practices to provide uniform, uninterrupted, and consistent connectivity across the world.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. Compare the evolution of 5G, system concepts and spectrum challenges.
- 2. Relate various architecture, Beam forming and hardware technologies for mmW communications.
- 3. Analyze the requirements and fundamental techniques for MTC and D2D Communication.
- 4. Apply various radio access technologies for 5G networks.
- 5. Analyze the fundamentals, resource allocation and transceiver algorithms for Massive MIMO.

UNIT I

DRIVERS FOR 5G

Historical Trend for Wireless Communication Mobile Communications Generations: 1G to 4G Evolution of LTE Technology to Beyond 4G-Pillars of 5G- Standardization Activities -Use cases and Requirements - System Concept -Spectrum and Regulations: Spectrum for 4G-Spectrum Challenges in 5G -Spectrum Landscape and Requirements-Spectrum Access Modes and Sharing Scenarios

UNIT II

5G ARCHITECTURE AND MILLIMETER WAVE COMMUNICATION

5G Architecture: Software-Defined Networking Network Function Virtualization Basics about RAN Architecture High-Level Requirements for 5G Architecture-Functional Architecture and 5G Flexibility-Physical Architecture and 5G Deployment Millimeter Wave Communication: Channel Propagation-Hardware Technologies for mmW Systems-Deployment Scenarios-Architecture and Mobility-Beamforming-Physical layer Techniques

UNIT III

MACHINE TYPE AND D2D COMMUNICATION

MTC: Use cases and Categorization-MTC Requirements Fundamental Techniques for MTC-Massive MTC-Ultra-reliable Low-latency MTC D2D: from 4G to 5G-Radio Resource Management for Mobile Broadband D2D-Multi-hop D2D Communications for Proximity and Emergency Services-Multi-operator D2D Communication

9 Hours

9 Hours

UNIT IV

5G RADIO ACCESS TECHNOLOGIES

Access Design Principles for Multi-user Communications-Multi-carrier with Filtering-Nonorthogonal Schemes for Efficient Multiple Access-Radio Access for Dense Deployments -Radio Access for V2X Communication-Radio Access for Massive Machine-type Communication

UNIT V

MASSIVE MIMO

MIMO in LTE-Single user MIMO-Multi user MIMO-Capacity of Massive MIMO-Pilot Design of Massive MIMO-Resource Allocation and Transceiver Algorithms for Massive MIMO-Fundamentals of Baseband and **RF** Implementation in Massive MIMO-Channel Models

FURTHER READING

5G LAN support for IOT in cloud office - Network slicing

Reference(s)

- Asif Oseiran, Jose F. Monserrat, 5G Mobile and Wireless Communications Technology, Cambridge 1. University Press,2016
- 2. Jonathan Rodriguez, Fundamentals of 5G Mobile Networks, Wiley, 2015
- 3. Patrick Marsch, Omer Bulakci, 5G System Design Architectural and Functional Considerations and Long Term Research, Wiley, 2018
- 4. Benny Bing,5G Technologies and applications,September 2018

21SE53 CYBER SECURITY

Course Objectives

- Identify different types of cybercrime and cyber law
- Recognized various tools & methods in Cyberline •
- Analyze Indian IT Act 2008 and various security standards. .

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- Understand the concept of cybercrime and global Perspective on cybercrimes. 1.
- 2. Understand different forms of hacking techniques and security challenges

9 Hours

9 Hours

Total: 45 Hours

3003

- 3. Apply relevant tools and methods for various Cyber crimes.
- 4. Analyze IT law in various legal issues
- 5. Evaluate Information Security Standards compliance during software design and development

UNIT I

INTRODUCTION TO CYBERCRIME

Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes

UNIT II

CYBER OFFENSES

How criminal plan the attacks, Social Engineering, Cyber stalking, Cyber caf $\tilde{A}f\hat{A}$ [©] and Cybercrimes, Botnets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones.

UNIT III

TOOLS AND METHODS USED IN CYBERLINE

Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SOL Injection, Buffer Over Flow, Attacks on Wireless Networks, Identity Theft (ID Theft)

UNIT IV

CYBERCRIMES AND CYBERSECURITY: THE LEGAL PERSPECTIVES

Introduction, Cybercrime and the Legal Landscape around the World, Why Do We Need Cyberlaws: The Indian Context, Indian IT Act 2008, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment.

UNIT V

INFORMATION SECURITY STANDARD COMPLIANCES

Compliance Overview, Major IT Requirements by Regulation, SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI, Common Compliance Reports & Tools.

FOR FURTHER READING

The Intellectual Property Aspect in Cyber Law, Evidence Aspect in Cyber Law

Reference(s)

- Nina Godbole, Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and 1. Legal Perspectives, reprint-2018, Wiley India, New Delhi,.
- 2. Vishwanathan Suresh T, The Indian Cyber Law, 2nd Edition 2001, Bharat Law House.
- 3. Ministry of Law, Justice and Company Affairs (Legislative Department), The Information technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.
- Adv. Prashant Mali, Cyber law & Cyber Crimes- Information Technology Act, 2000 with IT Rules, 2nd 4. Edition August 2015, Snow White Publications Pvt. Ltd.
- 5. Charles P. Pfleeger and Shari Lawrence Pfleeger, Security in Computing, 5th Edition, January 2015, Pearson Publication.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

6. Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, 2017 Wiley India, New Delhi.

21SE54 DEVOPS TOOLS AND TECHNOLOGIES 3003

Course Objectives

- Describe the need for DevOps in Software development.
- Develop software projects using Jenkins and GIT and Ansible tools.
- Use the Docker tool to deliver software in packages called containers.

Programme Outcomes (POs)

c. Students should be 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. e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the basics of DevOps for fast and reliable Software Development.
- 2. Apply jenkin tool to build and test the software projects
- 3. Develop repositories in GIt to keep track of version control.
- 4. Apply Ansible tool to perform configuration management, application deployment, intraservice orchestration, and provisioning.
- 5. Apply Docker to separate applications from infrastructure to deliver software quickly.

UNIT I

INTRODUCTION

Devops Introduction - DevOps and Software Development Life Cycle : Waterfall Model and Agile Model - Evolution of Cloud Computing : IAAS ,SAAS , PAAS Private, Public and Hybrid Clouds - Linux Administration and Shell Scripting.

UNIT II

CONTINUOUS INTEGRATION WITH JENKINS

Continuous Integration with Jenkins - Configure Jenkins -Jenkins Management - Scheduling - Maven Build Scripts - Support for the GIT version control System - JOBS - Jenkins Builds - Plugins - Securing Jenkins

UNIT III

GIT AND MAVEN

GIT Features - 3-Tree Architecture-GIT - Clone, Commit, Push - Project managements - Build tool - Maven - Build requirements - Maven POM Builds pom.xml - Build Life Cycle - repository Maven Dependencies - Maven Plugins

9 Hours

9 Hours

UNIT IV

ANSIBLE

Introduction - Ansible Server Configuration - Infrastructure Management SSH Connection in Ansible Master - YAML Scripts - Host Inventory - Ad-hoc Commands -Playbooks - Modules - Ansible Roles.

UNIT V

DOCKER

Docker Introduction- Docker Installation- Docker Containers - Docker Command Line Interphase- Compose-Hub - Trusted Registry - swarm - attach - File & Commands

FURTHER READINGS

Amazon AWS, Google Cloud Services - Microsoft Azure

Reference(s)

- Liming Zhu, Ingo M. Weber, Len Bass ,DevOps: A Software Architect's Perspective (SEI Series in 1. Software Engineering), Addison-Wesley; 1st edition 2015
- 2. Gene Kim, Patrick Debois, Professor John Willis, Jez Humble, The DevOPS Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations ,: IT Revolution Press, 2017
- 3. David Farley Jez Humble ,Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, 2018
- Nicole Forsgren Phd, Jez Humble, Gene Kim, Accelerate: The Science of Lean Software and Devops: 4. Building and Scaling High Performing Technology Organizations, IT Revolution Press, 2018

21SE55 SOFTWARE REVERSE ENGINEERING 3003

Course Objectives

- To provide a broad introduction to Reverse Engineering and their programming
- To explain and apply the fundamental concepts and terminology of Reverse Engineering. •
- To explain and address the fundamental problems of Reverse Engineering. •

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Identify the scope of reverse engineering in software development.
- 2. Classify low level and high level programming aspects for reverse engineering.
- 3. Use Reversing Tools for applications.

9 Hours

9 Hours

- 4. Interpret protection breaking, cracking and disassembly processes.
- 5. Apply object oriented approach for reverse engineering using a programming paradigm.

UNIT I

FOUNDATIONS OF REVERSE ENGINEERING

Reverse Engineering, Software Reverse Engineering, Reversing Applications, Goals of reverse engineering and Steps of Software Reverse Engineering

UNIT II

LOW LEVEL SOFTWARE AND WINDOWS FUNDAMENTALS

Reversing process, Low Level Software-High-Level perspectives, Low level perspectives, Assembly language, A primer on compilers and compilation, Execution Environments

UNIT III

REVERSING TOOLS

Reversing Approaches, Disassemblers, Debuggers, Decompilers, System -Monitoring Tools, Patching Tools, Miscellaneous Reversing Tools

UNIT IV

CRACKING AND DISASSEMBLY

Piracy and copy protection, Anti Reversing techniques, Breaking protections, Reversing.Net, Decompiling classes, Obfuscating classes

UNIT V

OBJECT ORIENTED CODE

Accessing Non-Public methods and variables of a class, Replacing and patching Application classes, Manipulating java security, Reverse engineering applications, Intercepting Control flow, Software Production.

FURTHER READINGS

Version control using Git repository - Reverse engineering attacks and tools for cybersecurity

Reference(s)

- Eldad Eilam Reversing Secrets of Reverse Engineering, Wiley Publishing, Inc, 2011. 1.
- 2. Alexandre Gazet, and Elisas Bachallany, Practical Reverse Engineering X86, X64, ARM, Windows, Kernel, Reversing Tools and Obfuscation by Bruce Dang, Wiley 2014.
- Paolo Tonella, Alessandra Potrich, Reverse Engineering of Object Oriented Code by Springer Science 3. 2005.
- 4. Covert Java Techniques for Decompiling, Patching and Reverse Engineering by Alex Kalinovsky, SAMS Publishing 2004.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

21SE56 HUMAN COMPUTER INTERFACE 3003

Course Objectives

- To learn about designing the user interfaces considering human and computer capabilities and constraints.
- To understand the user-centered design and usability principles.
- To Know about Web UI design principles.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the usability levels for interactive systems.
- 2. Apply the design development methodologies involved in user interface.
- 3. Develop skills in handling virtual environments and its exploitation.
- 4. Apply the diverse input methods available for interfacing
- 5. Analyse the different types of Information Search and Visualization Techniques.

UNIT I

INTRODUCTION

Goals of System Engineering, Goals of User Interface Design, Usability Motivations, High Level Theories, Object Action Interface Model, Principles, Guidelines for navigating the interface, organizing the display, getting the users attention.

UNIT II

DEVELOPMENT PROCESSES

Introduction, Organizational Design to Support Usability, The Three Pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact Statement for Early Design, Legal Issues-Expert Reviews, Usability Testing and laboratories, Surveys, Acceptance tests, Evaluation during Active use.

UNIT III

INTERACTION STYLES

Direct Manipulation and Virtual Environments: Introduction, Examples, Discussion, Menu Selection, Form Fillin, and Dialog Boxes: Task-Related Menu Organization, Fast Movement Through Menus, Command and Natural Languages: Functionality to Support Users Tasks, Command-Organization Strategies, Benefits, Naming and Abbreviations, Natural Language in Computing

9 Hours

9 Hours

UNIT IV

INTERACTION DEVICES

Introduction, Keyboards and Functions, Pointing Devices, Speech recognition ,Digitization and Generation, Image and Video Displays, Printers, Theoretical Foundations, Expectations and Attitudes, User Productivity, Variability, Error messages, Non anthropomorphic Design, Display Design, color, Reading from Paper versus from Displays, Preparation of Printed Manuals, Preparation of Online Facilities.

UNIT V

INFORMATION SEARCH AND VISUALIZATION

Introduction, Individual Window Design, Multiple Window Design, Coordination by Tightly Coupled Window- Image Browsing, Personal Role Management and Elastic Windows Goals, Asynchronous Distributed Interfaces, Synchronous Distributed Interfaces, Face to Face, Applying Computer Supported Cooperative Work to Education, Search in Textual Documents and Database Querying, Multimedia Documents Searches, Advance Filtering and Search Interfaces, Information Visualization.

FOR FURTHER READING

Modeling Rich Interaction, Group ware.

Reference(s)

- Ben Shneiderman, Catherine Plaisant, "Designing the User Interface", 6th Edition, Pearson, 2017. 1.
- 2. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, "Human - Computer Interaction ", Pearson, 2010.
- 3. Jonathan Lazar, Jinjuan Heidi Feng, "Research Methods in Human Computer Interaction", Morkan Kaufmann,2017
- 4. Wilbert O Galitz,"The Essential guide to User Interface Design", 2nd Edition, Wiley India, 2009.
- 5. Jef Raskin, "The Human Interface", AddisonWesley 2000.

21SE57 DATA SCIENCE USING R

Course Objectives

- Understand the fundamental algorithmic concepts of data science.
- Implement data analytics concepts using R •
- Apply the different types of modeling methods for analyzing the data •
- Deploy the visualization techniques to predict the future set •

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

29

9 Hours

Total: 45 Hours

3003

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the fundamental concepts of data science.
- 2. Analyze 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

INTRODUCTION TO DATA SCIENCE

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

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

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

MAP REDUCE

Introduction distributed file system algorithms using mapreduce, MatrixVector 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

DATA VISUALIZATION

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 one window exporting graph using graphics parameters. Case studies

FURTHER READING

Decision Tree in R, R Random Forest, Generalized Linear Model, R Vs Python

Reference(s)

- 1. Nia Zumel and John Mount, Practical Data Science with R, Manning Publications, 2019.
- 2. Hadley Wickham and Garett Grolemund, R for Data Science, O Reilly, 2017
- 3. Jure Leskovec, Anand Rajaraman and Jeffrey D. Ullman, Mining of Massive Datasets, Cambridge University Press, Third Edition 2020.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

Total: 45 Hours

(V

- 4. Boris Lubinsky, Kevin T. Smith, and Alexey Yakubovich, Professional Hadoop Solution, Wiley, 2015.
- 5. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort and Abhijit Dasgupta, Practical Data Science Cookbook, Packt Publishing Ltd., 2017.
- 6. htt ps://r4ds.had.co.nz/transform.html.

21SE58 SOCIAL NETWORK ANALYSIS 3003

Course Objectives

- Interpret the emerging need of social network analysis and their various representations.
- Apply various community detection techniques in social network analysis.
- Apply various visualization techniques for small and large data.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. Apply knowledge for current web development in the era of Social Web.
- 2. Develop a model for integrating data for knowledge representation.
- 3. Apply the tools and an algorithm for mining in social networks.
- 4. Examine the human behavior and trust disputes of social networks.
- 5. Apply visualization technique in Social networks.

UNIT I

INTRODUCTION TO SOCIAL NETWORK ANALYSIS

Introduction to Web: Limitations of current Web- Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks.

UNIT II

UNIT III

MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION

Ontology languages for the Semantic Web: RDF and OWL - Modelling and aggregating social network data: State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced Representations.

EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS

Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social

9 Hours

9 Hours

Networks: Definition of Community - Evaluating Communities - Methods for Community Detection-Applications of Community Mining Algorithms - Tools for Detecting Communities Social Network Infrastructures and Communities - Decentralized Online Social Networks: Introduction- Challenges for DOSNs- General purpose DOSNs.

UNIT IV

PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES

Understanding and Predicting Human Behavior for Social Communities - User Data Management-Inference and Distribution - Enabling New Human Experiences: Reality Mining - Context Awareness - Privacy in Online Social Networks: Trust in Online Environment - Trust Models Based on Subjective Logic - Trust Network Analysis - Trust Transitivity Analysis - Combining Trust and Reputation - Trust Derivation Based on Trust Comparisons.

UNIT V

VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

Graph Theory- Centrality- Clustering - Node-Edge Diagrams, Matrix representation, Visualizing Online Social Networks - Visualizing Social Networks with Matrix-Based Representations: Matrix and Node-Link Diagrams - Hybrid Representations - Applications of social network analysis: Covert Networks - Community Welfare -Collaboration Networks.

FURTHER READING

A Case Study on the Twitter-Applications - Cover networks - Community welfare

Reference(s)

- 1. Gerardus Blokdyk, Social Network Analysis A Complete Guide - 2020 Edition.
- 2. George Ritzer Wendy Wiedenhoft Murphy, Social Network Analysis, 2019.
- 3. Nilanjan Dev, Samarjeet Borah, Rosalina Babo, Amira S. Ashour, "Social Network Analytics : Computational Research Methods and Techniques ", 1st Edition, Elsevier - (Academic Press), 2018.
- 4. John Scott ,Social Network Analysis, 2017, SAGE Publications Ltd.

21SE59 MACHINE LEARNING TECHNIQUES 3003

Course Objectives

- To introduce students to the basic concepts and techniques of Machine Learning •
- To have a understanding of the Supervised and Unsupervised learning techniques •
- To study the various probability based learning techniques •
- To understand graphical models of machine learning algorithms

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be able to demonstrate a degree of mastery over the area as per the specialization of the

9 Hours

Total: 45 Hours

program. The mastery should be at a level higher than the requirements in the appropriate bachelor program. d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. To understand the supervised, unsupervised and semi-supervised learning models.
- 2. Apply the appropriate machine learning strategy for any given problem.
- 3. Design systems that use the appropriate Trees in Probabilities Models of machine learning.
- 4. Analyze the existing machine learning algorithms to improve classification efficiency.
- 5. Design systems that use the appropriate graph models of machine learning.

UNIT I

INTRODUCTION

Learning - Types of Machine Learning - Supervised Learning - The Brain and the Neuron -Design a Learning System - Perspectives and Issues in Machine Learning - Concept Learning Task - Concept Learning as Search - Finding a Maximally Specific Hypothesis - Version Spaces and the Candidate Elimination Algorithm - Linear Discriminants - Perceptron - Linear Separability - Linear Regression

UNIT II

LINEAR MODELS

Multi layer Perceptron - Going Forwards - Going Backwards- Back Propagation Error - Multilayer Perceptron in Practice - Examples of using the MLP - Overview - Deriving Back Propagation - Radial Basis Functions and Splines - Concepts -RBF Network - Curse of Dimensionality Interpolations and Basis Functions - Support Vector Machines.

UNIT III

TREE AND PROBABILISTIC MODELS

Learning with Trees - Decision Trees - Constructing Decision Trees - Classification and Regression Trees -Ensemble Learning - Boosting - Bagging - Different ways to Combine Classifiers - Probability and Learning - Data into Probabilities - Basic Statistics - Gaussian Mixture Models - Nearest Neighbor Methods -Unsupervised Learning - K Means Algorithm - Vector Quantization - Self Organizing Feature Map.

UNIT IV

DIMENSIONALITY REDUCTION AND REVOLUTIONARY MODELS

Dimensionality Reduction - Linear Discriminant Analysis - Principal Component Analysis - Factor Analysis - Independent Component Analysis - Locally Linear Embedding - Isomap - Least Squares optimization -Evolutionary Learning - Genetic Algorithms - Genetic Offspring - Genetic Operators - Using Genetic Algorithms - Reinforcement Learning - Overview - Getting Lost Example - Markov Decision Process

UNIT V

GRAPHICAL MODELS

Markov Chain Monte Carlo Methods - Sampling - Proposal Distribution - Markov Chain Monte Carlo - Graphical Models - Bayesian Networks - Markov Random Fields - Hidden Markov Models - Tracking Methods

9 Hours

9 Hours

9 Hours

9 Hours

Total: 45 Hours

3003

Syllabi: M.E. Software Engineering| Minimum Credits to be earned: 68| Regulations 2021

FOR FURTHER READING

Deep Learning Platform, Generative Adversarial Networks, Adversarial machine learning

Reference(s)

- 1. Ethem Alpaydin, "Introduction to Machine Learning 3s (Adaptive Computation and MAchine Learning Series)", Third Edition, MIT Press, 2014
- 2. Jason Bell, "Machine learning Hands on for Developers and Technical Professionals" ,First Edition, Wiley, 2014
- 3. Peter Flach, "Machine learning: The Art and Science of Algorithms that MAke sense of Data", First Edition, Cambridge University Press, 2012
- 4. Stephen Marsland, "Machine Learning An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014
- 5. Tom M Mitchell, "Machine Learning", First Edition, McGraw Hill Education, 2013

21SE60 DEEP LEARNING

Course Objectives

- To present the mathematical, statistical and computational challenges of building stable representations for high-dimensional data, such as images, text and data
- To develop into selected topics of Deep Learning, discussing recent models from both supervised and unsupervised learning
- Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Explain the evolution of deep neural networks and the potential of such networks in automatic learning.
- 2. Analyze the need for deep learning algorithms which are more appropriate for different types of learning tasks in various domains
- 3. Apply convolutional architectures for unsupervised learning and solve real time problems.
- 4. Analyze various types of recurrent neural networks and apply their potential in different domains.
- 5. Implement deep learning algorithms and solve real-world problems.

35

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021

UNIT I

INTRODUCTION

Biological Neuron, Idea of computational units, McCulloch Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability, Convergence theorem for Perceptron Learning Algorithm, Feedforward Networks Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, autoencoders

UNIT II

DEEP NEURAL NETWORKS

Difficulty of training deep neural networks, Greedy layerwise training. Better Training of Neural Networks Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization)

UNIT III

RECURRENT NEURAL NETWORKS

Backpropagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, **Bidirectional RNNs**

UNIT IV

CONVOLUTIONAL NEURAL NETWORKS AND GENERATIVE MODELS

Architectures, convolution / pooling layers LeNet, AlexNet. Generative model Restricted Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines

UNIT V

RECENT TRENDS AND APPLICATIONS

Recent trends Variational Autoencoders, Generative Adversarial Networks, Multi task Deep Learning, Multi view Deep Learning, Applications: Vision, NLP, Speech.

FOR FURTHER READING

Computer Vision, Supervised Machine Learning, Unsupervised Machine Learning

Reference(s)

- 1. 1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
- 2. 2. Bengio, Yoshua, Learning deep architectures for AI, Foundations and trends in Machine Learning 2.1 (2009) 1127
- 3. Abadi, Tensor flow Large-scale machine learning on heterogeneous distributed systems, arXiv preprint 3. arXiv1603.04467 (2016).
- 4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw Hill Education, 2020 4.
- 5. 5. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2019.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

21SE61 DIGITAL IMAGE PROCESSING 3003

Course Objectives

- Understand the basic principles of digital images processing and transformations.
- Apply the enhancement algorithms to improve the quality of images.
- Apply the restoration techniques to recover the original images.
- Implement the coding process to perform image compression with coloring models.
- Demonstrate a meaningful image using segmentation and representation algorithms.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the basic principles of digital images processing and transformations.
- 2. Apply the enhancement algorithms to improve the quality of images.
- 3. Apply the restoration techniques to recover the original images.
- 4. Implement the coding process to perform image compression with coloring models.
- 5. Demonstrate a meaningful image using segmentation and representation algorithms.

UNIT I

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

Elements of visual perception - Image sampling and quantization - Basic relationship between pixels - Basic geometric transformations -Introduction to Transform - Discrete Cosine Transform - Discrete Fourier Transform (DFT) - Fast Fourier Transform(FFT) - Wavelet Transforms- DWT and CWT -Curvelets.

UNIT II

IMAGE ENHANCEMENT TECHNIQUES

Spatial Domain methods Basic grey level transformation -Histogram equalization -Image subtraction - Image averaging -Spatial filtering Smoothing, sharpening filters - Laplacian filters - Frequency domain filters Smoothing - Sharpening filters - Homomorphic filtering.

UNIT III

IMAGE RESTORATION

Model of Image Degradation/restoration process - Noise models - Inverse filtering -Least mean square filtering -Constrained least mean square filtering - Blind image restoration-Pseudo inverse - Singular value decomposition.

9 Hours

9 Hours

9 Hours

9 Hours

Total: 45 Hours

IMAGE COMPRESSION AND COLOR MODELS

Lossless compression Variable length coding - LZW coding - BIT plane coding- predictive coding-DPCM. Lossy Compression Transform coding - Wavelet coding - Basics of Image compression standards JPEG2000, MPEG. Color Models -pseudo Color Image processing.

UNIT V

IMAGE SEGMENTATION AND REPRESENTATION

Point, Line and Edge detection - Thresholding - Global- Otsus Method - Multiple and Variable Thresholding - Region Based segmentation. Boundary representation chair codes- Polygonal approximation - Boundary segments - Boundary descriptors Simple descriptors -Fourier descriptors - Regional descriptors -Simple descriptors - Texture - Moment Invariants.

FURTHER READING

Morphological Image Processing-Wavelet based Image Compression

Reference(s)

- 1. Rafael C Gonzalez, Richard E Woods 3nd Edition, Digital Image processing, Pearson Education, 2018.
- 2. S. Jayaraman, S. Esakkirajan, T. Veerakumar, Digital Image Processing, Tata McGraw Hill education private limited, Second Edition, 2020.
- 3. William K Pratt, Digital Image Processing, John Willey, 2007.
- 4. MillmanSonka, Vaclav Hlavac, Roger Boyle, Broos/colic, Learning Image Processing analysis and Machine Vision, Thompson, Fourth Edition, 2015.
- 5. Chanda Dutta Majumdar, Digital Image Processing and Applications, Prentice Hall of India, Second Edition, 2011.
- 6. http://nptel.iitm.ac.in/courses/Webcourse-contents/ Digi_Img_Pro.

21SE62 COMPUTER VISION 3003

Course Objectives

- Understand the image formation and processing in the field of computer vision.
- Apply the feature extraction and segmentation techniques to extract the information from the images.
- Implement the methods used for image alignment and estimation on 2D and 3D point matching.
- Apply the object recognition and search options for the given data set.
- Develop a computer algorithm to process visual data from the real-time applications.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions

UNIT IV

for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Apply geometric transformations for restoring the digital images.
- 2. Build the solutions for real world problems using feature extraction and segmentation techniques.
- 3. Demonstrate the algorithms for aligning images and estimating motion in video sequences.
- 4. Develop algorithms for object recognition and image searching.
- 5. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

UNIT I

UNIT I IMAGE FORMATION AND PROCESSING

Computer Vision introduction - Geometric primitives and transformations - Photometric image formation -The digital camera - Fourier transforms -Pyramids and wavelets - Geometric transformations - Global optimization- Application Image Restoration and Morphing.

UNIT II

FEATURE DETECTION AND SEGMENTATION

Feature detectors - descriptors - matching and tracking - Edge and line detection- Application Edge editing and Enhancement and Rectangle detection - Segmentation- Active contours - Split and merge - Mean shift and mode finding Normalized cuts-Graph cuts and energy-based methods Application Medical Image Segmentation.

UNIT III

2D AND 3D POINT SET ALIGNMENT AND ESTIMATION

2D and 3D feature-based alignment -Pose estimation - Geometric intrinsic calibration - Triangulation - Twoframe structure from motion _ Factorization _ Bundle adjustment Constrained structure and motion-Spline based motion - Optical flow Estimation - Application Augmented reality.

UNIT IV

RECOGNITION

Objects Detection - Instance recognition- Category recognition - Context and scene understanding - Application Location identification and image Search.

UNIT V

ROBOT VISION

Optimal Design of Robot Vision Systems - 3D robot navigation in dynamic environments - recognizing Human Gait Types - Industrial Assembly and Quality Control – Biometric identification.

FURTHER READING

Histogram processing, noise models, Morphological Image Processing, Object recognition

Reference(s)

Richard Szeliski, Computer Vision Algorithms and Applications, Springer-Verlag London Limited ,2nd 1. Edition,2021.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

- 2. Dr. Shruti Jain and Dr. Sudip Paul, Recent Trends in Image and Signal Processing in Computer Vision,1st Edition,2020.
- 3. Steve Holden, Computer Vision: Advanced Techniques and Applications, CLANRYE International, 1st Edition, 2019.
- 4. R.C. Gonzalez and R.E. Woods, Digital Image Processing, 4th edition Pearson , 2017. Ales Ude , Robot Vision ,Open Access Book , In-Tech , 2010
- 5. Ales Ude, Robot Vision, Open Access Book, In-Tech, 2010
- 6. D. A. Forsyth, J. Ponce Computer Vision A Modern Approach, Pearson Education, Second Edition, 2012.

21SE63 BLOCKCHAIN 3003

Course Objectives

- To introduce students to the basic concepts and techniques of BlockChain
- Identify major research challenges and technical gaps existing between theory and practice in blockchain domain
- Understand emerging abstract models for Blockchain Technology
- Recognize the architecture and design of Decentralized Applications

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the basic concepts of BlockChain Technology and Distributed Ledger Technology
- 2. Apply the Cryptographic techniques in BlockChain Technology
- 3. Apply the Consensus model in BlockChain Technology
- 4. Apply the decentralized applications and smart contract to enable a decentralized future
- 5. Apply the appropriate functionality of smart contract in Ethereum blockchain

UNIT I

BLOCKCHAIN BASICS

Introduction to BlockChain Technology, Bitcoin and Blockchain History, Basics of BlockChain, Types of BlockChain, BlockChain and Crypto currency, Distributed Ledger Technology (DLT), Bitcoin Mechanics and Optimizations, BlockChain Mining, Mining Bitcoin, Bitcoin Wallets

UNIT II

BLOCKCHAIN AND CRYPTOGRAPHY

Introduction to Cryptographic concepts, Overview of Hashing, Signature schemes, Encryption schemes and

9 Hours

Elliptic Curve Cryptography, Public Key Cryptosystems, Private vs. Public BlockChain and use cases, Hash Puzzles.

UNIT III

CONSENSUS MECHANISMS

The consensus problem, Asynchronous Byzantine Agreement, AAP protocol and its analysis, Nakamoto Consensus on Permission-less, nameless, peer-to-peer network, Abstract Models for BLOCKCHAIN, GARAY model, RLA Model, Proof of Work (PoW), Proof of Stake (PoS), Hybrid models (PoW + PoS).

UNIT IV

SMART CONTRACT AND DECENTRALIZED APPLICATIONS (DAPPS)

Smart Contracts: Enabling a Decentralized Future, Game Theory and Network Attacks: How to Destroy Bitcoin, Crypto economics, Architecture of a DAPPS: the front-end client interface, backed by the blockchain: the basic design of a Dapp, Truffle development process and commands (init, develop, test and migrate).

UNIT V

ETHEREUM

Ethereum, Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity, Ethereum protocol, Ethereum blockchain, Create accounts, Unlock accounts, Mine, Transact, Transfer Ethers, and Check balances.

FURTHER READING

Zero Knowledge proofs and protocols in Blockchain, Succinct non interactive argument for Knowledge (SNARK), pairing on Elliptic curves, Zcash.

Reference(s)

- 1. Bitcoin and Cryptocurrency Technologies by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder
- 2. Mastering Bitcoin by Andreas Antonopoulos
- 3. Bhadoria, Robin Singh, and Vaibhav Agasti. "The paradigms of blockchain technology: myths, facts & future." International Journal of Information Systems and Social Change (IJISSC) 10.2 (2019): 1-14.
- 4. Carlozo, Lou. "What Is Blockchain? Here"s a Primer on the Potentially Transformative Digital Ledger Technology." Journal of Accountancy 224.1 (2017): 29.
- 5. Michael, J., A. L. A. N. Cohn, and Jared R. Butcher. "Blockchain technology." The Journal 1.7 (2018).
- 6. R.Pass et al, Fruitchain, a fair blockchain, PODC 2017

9 Hours

9 Hours

9 Hours

21SE64 DESIGN OF ENTERPRISE SOFTWARE SYSTEMS 3003

Course Objectives

• Familiarize students with technology and programming platform for developing enterprise software systems

• Enable students to design databases and carry out coding design for the development of enterprise software systems

• Enable students to maintain large scale enterprise software systems by analyzing existing coding and incorporating change requirements

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Develop software applications using enterprise software editions
- 2. Design role management system to control the resource allocation in enterprise software systems.
- 3. Design human resource management system for enterprise software systems.
- 4. Design systems to manage financial accounting, material and inventory management for enterprise systems.
- 5. Analyze production process for manufacturing and other different types of enterprises.

UNIT I

PROGRAMMING BASICS

Introduction to Java Enterprise System - Server side programming - Client Side Programming - JavaScripts Libraries - Web Application Life Cycle Events Framework - Web Application Security - Filters - Introduction to RESTful web services

UNIT II

ROLE MANAGEMENT SYSTEM

Defining Roles, Role Management, User Management, User Activity Tracking, Design and implementation

UNIT III

HUMAN RESOURCE MANAGEMENT

Employee Management, Leave Management, Time and Attendance Management, Payroll Management, HR Reporting, Design and Implementation

9 Hours

9 Hours

9 Hours

41

UNIT IV

MATERIAL MANAGEMENT AND ACCOUNTING

Introduction to financial accounting, Design of accounting systems, Stores management system design, inventory and stock management

UNIT V

PRODUCTION SYSTEM: CASE STUDY

Defining Production Process for Academics, Curriculum, Time Management, Attendance Management, Performance Management, Design and Implementation

FOR FURTHER READING

Cloud based enterprise systems

Reference(s)

- 1. Sergey V. Zykov, Alexander Gromoff, "Software Engineering for Enterprise System Agility: Emerging Research and Opportunities", IGI Global, 2018
- 2. Klaus-Dieter Gronwald , Integrated Business Information Systems: A Holistic View of the Linked Business Process Chain ERP-SCM-CRM-BI-Big Data, Springer, 2020
- 3. John Brock, Arun Gupta, GeertjanWielenga, "Java EE and HTML5 Enterprise Application Development", McGraw Hill Education, 2014.

21SE65 ENTERPRISE SYSTEMS SECURITY AND FORENSICS 3003

Course Objectives

- Design solutions secure enterprise eco systems components including network, web server, application server, database server and devices.
- Design and implement a Zero Trust security architecture for an enterprise to deliver significantly improved security and streamlined operations.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Manage enterprise networking and enterprise firewall to protect enterprise resources.
- 2. Identify the client side and server side vulnerabilities of enterprise software and protect them from exploits.
- 3. Deploy enterprise application and database servers and secure them.
- 4. Infer role based access systems and protect enterprise data from unauthorized modifications.
- 5. Design and implement zero trust security systems

9 Hours

9 Hours

43

Syllabi: M.E. Software Engineering| Minimum Credits to be earned: 68| Regulations 2021

UNIT I

ENTERPRISE NETWORK SECURITY

UNIT II

ENTERPRISE APPLICATION SECURITY

Enterprise Application Architecture, Common threats, Browser exploits, Client side security, server side security, sql attacks, script injection attacks, web application firewalls, Application Level Forensics

Enterprise Networking - Firewall Management, System Deployment Architecture, VLAN and Network Isolation, port blocking, safeguarding DNS, DNS attack tactics and case studies, Distributed Denial of

Service mitigation, Network Forensics, Open-source security tools for network forensic analysis

UNIT III

ENTERPRISE SERVER SECURITY

Server Deployment, Securing Server access, Securing Communication with Web Servers SSL configuration, web server vulnerabilities, Penetration Testing Forensics analysis of web servers, Securing Application Servers, Securing Database Servers, Database Forensics

UNIT IV

ENTERPRISE DATA SECURITY

Privacy and Protection, Data Security Policies, user rights management, Data Hashing, Role based access, Detecting unauthorized data modifications, Data access forensics

UNIT V

ZERO TRUST SECURITY

Zero Trust security principles, operational benefits of Zero Trust, Zero Trust security architectures, Impacts and benefits

FOR FURTHER READING

eMAIL spam -Malware - Password security - Anti-Social, Social Networking

Reference(s)

- 1. Suku Nair, Marco Marchetti, John Hopkinson, Seth Fogie, "Enterprise Security: Compliance v. Competence", 2021
- 2. Jason Garbis and Jerry W. Chapman, "Zero Trust Security: An Enterprise Guide", APress, 2021
- Manish Gupta and Raj Sharman, Information Technology Risk Management and Compliance in Modern Organizations, 2017
- 4. Adrian Pruteanu and Zeal Vora, Enterprise Cloud Security and Governance Efficiently set data protection and privacy principles, 2017.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

21SE66 CLOUD INFRASTRUCTURE MANAGEMENT SYSTEMS 3003

Course Objectives

- Familiarize students with the practical aspects of IaaS (Infrastructure as a Service) cloud computing model
- Familiarize students with the installation and configuration procedure of compute, storage and networking components of OpenStack platform for establishing enterprise private cloud

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Design the basic environment required for openstack implementation and configure keystone service for authentication and glance service for managing cloud vm images authentication and glanceservice for managing cloud vm images
- 2. Install and configure compute and neutron service for creating Infrastructure as the Service(IaaS)cloud platform
- 3. Install and Configure dashboard service to manage projects, roles and users.
- 4. Install and Configure Storage Services.
- 5. Install and Configure Orchestration service, Telemetry service, Database Services, ContainerServices

UNIT I

BASIC ENVIRONMENT

Introduction to Cloud Computing - Openstack Architecture - Basic Requirements - Configuring Identity service - Configuring keystone and its dataset - Image service - Managing Glance

UNIT II

COMPUTE AND NETWORK MANAGEMENT

Compute service - Installing Nova with its API - Managing security groups - Networking service - Managing neutron services - VLAN Manager networking

UNIT III

DASHBOARD MANAGEMENT

Dashboard Service - Horizon Installation - GUI Management and Maintenance - creating network - flavor creation - Resource usage monitoring

9 Hours

9 Hours

UNIT IV

STORAGE MANAGEMENT

Block Storage vs Object Storage - Installation and configuration of cinder - attach volume to VM instances - Configure booting from volume - Installation and configuration of swift - java api integration

UNIT V

VM MANAGEMENT

Orchestration service - Telemetry service- Launch VM instances

FOR FURTHER READING

Green Cloud Computing- Edge Computing- Cloud Cryptography. Load Balancing - Cloud Analytics - OPEN STACK

Reference(s)

- 1. Ben Silverman and Michael Solberg, OpenStack for Architects: Design production-ready private cloud infrastructure, 2nd Edition, PackT, 2018
- 2. Kevin Jackson, Openstack Cloud Computing Cookbook Fourth Edition, PackT, 2018
- 3. Uchit Vyas, Applied OpenStack Design Patterns: Design solutions for production-ready infrastructure with OpenStack components, APress, 2017

21SE67 NATURAL LANGUAGE PROCESSING 3003

Course Objectives

- Understand the representation and processing of Morphology and Part-of Speech Taggers
- Express different aspects of natural language syntax and the various methods used for processing syntax
- To know about various applications of natural language processing

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. Identify the different linguistic components of given sentences.
- 2. Design a morphological analyzer for a language using finite state automata concepts
- 3. Implement a parser by providing suitable grammar and words
- 4. Recognize the semantic role of the sentence and implement the semantic parsing
- 5. Apply the machine translation and statistical translation to extract the information from the sentence

9 Hours

9 Hours

46

Syllabi: M.E. Software Engineering| Minimum Credits to be earned: 68| Regulations 2021

UNIT I

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

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

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

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

APPLICATIONS

Named entity recognition and relation extraction- Information Extraction (IE) using sequence labeling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment- phrase-based translation - Question Answering- VXML Applications

FOR FURTHER READING

Word sense disambiguation-discourse analysis and lexical resources- porter stemmer, Lemmatizer, Penn Treebank, brill tagger, wordnet, PropBank, FrameNet, brown corpus, British National Corpus (BNC)

Reference(s)

- 1. Daniel Jurafsky and James H. Martin "Speech and Language Processing", Second Edition, Prentice Hall, 2020
- 2. Christopher D. Manning and Hinrich Schuetze, "Foundations of Statistical Natural Language Processing", MIT Press, 2014.
- 3. Roland R. Hausser, "Foundations of Computational Linguistics Human- Computer Communication in Natural Language", Springer, 2014.

9 Hours

8 Hours

10 Hours

10 Hours

8 Hours

AUDIT COURSES

21XE01 ENGLISH FOR RESEARCH PAPER WRITING 2000

Course Objectives

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

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

e. Comprehend and write effective technical reports, design documentation, and make effective presentations.

Course Outcomes (COs)

- 1. Illustrate the research ideas and writing journal papers
- 2. Creating research paper writing

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

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

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission. Total: 30 Hours

Reference(s)

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)

5 Hours

5 Hours

5 Hours

5 Hours

5 Hours

5 Hours

47

- 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. Highmans book.
- 4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

21XE02 COST MANAGEMENT OF ENGINEERING **PROJECTS**

Course Objectives

- To understand the cost concepts and different stages of project execution and its activities. ٠
- To understand cost behavior, management and its quantitative techniques. ٠

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

e. Comprehend and write effective technical reports, design documentation, and make effectivepresentations.

Course Outcomes (COs)

- 1. Apply the cost concepts in decision making.
- 2. Analyze the various stages of project execution and its activities.
- 3. Analyze the cost behavior and various types of costing.
- 4. Analyze the cost management and budget related decisions.
- 5. Analyze the quantitative techniques for cost management.

UNIT I

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

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 nontechnical 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

COST BEHAVIOR AND PROFIT PLANNING MARGINAL COSTING

48

6 Hours

6 Hours

6 Hours

2000

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.

UNIT IV

TOTAL QUALITY MANAGEMENT AND THEORY OF CONSTRAINTS

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

QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT

Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

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
- 4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
- 5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

21XE03 STRESS MANAGEMENT 2000

Course Objectives

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

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

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

Definitions of Eight parts of yog. (Ashtanga)

UNIT II

Yam and Niyam. Dos and Donts in life.i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii)Shaucha, santosh, tapa, swadhyay, ishwarpranidhan.

6 Hours

6 Hours

Total: 30 Hours

10 Hours

UNIT III

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

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.

21XE04 DISASTER MANAGEMENT 2000

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 inspecific 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

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

Course Outcomes (COs)

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

UNIT I

INTRODUCTION

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

UNIT II

REPERCUSSIONS OF DISASTERS AND HAZARDS

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

5 Hours

5 Hours

10 Hours

Total: 30 Hours

UNIT III

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

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

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

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.

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]

21XE05 VALUE EDUCATION

Course Objectives

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

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

e. Comprehend and write effective technical reports, design documentation, and make effectivepresentations.

5 Hours

5 Hours

5 Hours

5 Hours

Total: 30 Hours

2000
Course Outcomes (COs)

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

UNIT I

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

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

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 selfdestructive habits-Association and Cooperation-Doing best for saving nature.

UNIT IV

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.

Reference(s)

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

21XE06 PEDAGOGY STUDIES

Course Objectives

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

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

7 Hours

Total: 30 Hours

8 Hours

8 Hours

7 Hours

52

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021 e. Comprehend and write effective technical reports, design documentation, and make effective presentations.

Course Outcomes (COs)

- 1. What pedagogical practices are being used by teachers in formal and informal classrooms indeveloping 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 guidancematerials best support effective pedagogy? verall personality

UNIT I

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

THEMATIC OVERVIEW

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

UNIT III

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

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.

Reference(s)

- 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

8 Hours

8 Hours

7 Hours

7 Hours

Total: 30 Hours

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021 research project (MUSTER) country report 1. London: DFID

- 4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning ofbasic 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.

21XE07 BUSINESS ANALYTICS

Course Objectives

- Illustrate 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 businessproblems 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)

b. Use research-based knowledge to interpret/investigate the problems, provide solutions and worktowards the development of socially relevant products.d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.e. Comprehend and write effective technical reports, design documentation, and make effectivepresentations.

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

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 2000

54

Syllabi: M.E. Software Engineering | Minimum Credits to be earned: 68 | Regulations 2021 and estimation methods overview

UNIT II

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 ExploringData, Business Analytics Technology

UNIT III

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

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

DECISION ANALYSIS

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

Total: 30 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

6 Hours

6 Hours

6 Hours

21SE11 RESEARCH METHODOLOGY AND IPR 2002

Course Objectives

- Understand the techniques for research problem formulation, analysis and solution.
- Analyze research related information and follow research ethics in technical paper writing/presentation.
- Gain knowledge about Patent drafting and filing patents.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Formulate the research problems and identify the approaches to solve the problems.
- 2. Analyze literature survey and prepare reports based on research ethics
- 3. Develop research proposals and apply assessment procedures to review
- 4. Develop patents using the IPR & PCT guidelines
- 5. Adapt the licensing process for patents and analyse the developments of IPR

UNIT I

INTRODUCTION TO RESEARCH PROBLEM

Meaning of research problem -Sources of research problem-criteria characteristics of a good research problemerrors 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

LITERATURE REVIEW

Effective Literature studies approaches-analysis-Plagiarism-Research ethics- Review of the literature, searching the existing literature, reviewing the selected literature, developing a theoretical framework, developing a conceptual framework, writing about the literature reviewed.

UNIT III

TECHNICAL WRITING/PRESENTATION

Effective technical writing-how to write report-paper-Developing a research proposal-Format of Research proposal-a presentation and assessment by a review committee

6 Hours

6 Hours

6 Hours

3

UNIT IV

INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS(IPR)

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 Patents, Patenting under Patent Cooperation Treaty(PCT).

UNIT V

INTELLECTUAL PROPERTY RIGHT(IPR)

Patent Rights: Scope of Patent Rights, Licensing and transfer of Technology, Patent information and databases-Geographical Indications. New Developments in IPR: Administration of Patent system, IPR of Biological systems, Computer Software-Traditional knowledge -case studies.

FURTHER READING

Sampling: probability and non-probability sampling-Scaling: Thurston, Likert and Guttman scaling-Simulation based research methods

Total: 30 Hours

Reference(s)

- 1. C.R.Kothari , Gaurav Garg, Research Methodology Methods and Techniques, 4th Edition, New Age International Publishers, 2018.
- 2. Wayne Goddard and Stuart Melville, Research methodology An Introduction,2nd Edition, Juta and Company Ltd, 2007
- 3. Halbert, Resisting Intellectual Property, Taylor & Francis Ltd, 2007
- 4. Robert P.Merges, Peter S.Menell, Mark.A.Lemley, Intellectual property in New technological age, 2016
- 5. T.Ramappa, Intellectual Property Rights under WTO, S.Chand, 2008
- 6. Ranjit Kumar, 2nd Edition, Research Methodology A Step by Step Guide for beginners 2010

21SE12 ADVANCED DATA STRUCTURES AND ALGORITHMS 3003

Course Objectives

- Apply the various algorithms for applications involving probability and statistics in computing (data analytics)
- Evaluate and Perform hypothesis testing and to conclude the result for NP Complete problems.
- Design and build solutions for a real world problem by applying relevant algorithms.

Programme Outcomes (POs)

c. Students should be 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. e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Analyze the role of algorithms in computing and measure the efficiency
- 2. Design an algorithm for a specific problem using appropriate ADT"s.
- 3. Apply algorithm design approaches in problem specific manner.

6 Hours

- 4. Implement appropriate mathematical abstraction to solve problems.
- 5. Develop applications that solves NP complete problems

UNIT I

ALGORITHM ANALYSIS

Algorithm Analysis: Asymptotic Notation-Standard - Recurrences - Solution to Recurrences Randomized Algorithms- Randomized Quicksort, Analysis of Hashing algorithms. Algorithm Analysis Techniques -Amortized Analysis.

UNIT II

ABSTRACT DATA TYPES

External Memory ADT - B-Trees. Priority Queues and Their Extensions: Binomial heaps, Fibonacci heaps, applications to Shortest Path Algorithms. Partition ADT: Weighted union, path compression, Applications to MST.

UNIT III

ALGORITHM DESIGN TECHNIQUES

Dynamic Programming-Bellman-Ford, Greedy Algorithms. Network Flows-Max flow, min-cut theorem, Ford-Fulkerson, Edmonds-Karp algorithm, Bipartite Matching.

UNIT IV

AMORTIZED ANALYSIS AND STRING MATCHING ALGORITHMS

Aggregate Method - Accounting Method - Potential Method. String Matching Algorithms: KMP, Aho-Korasik algorithm, Z-algorithm.

UNIT V

NP-COMPLETENESS AND REDUCTIONS

NP Completeness - Cook Levine Theorem - Important NP Complete Problems - Reduction of standard NP Complete Problems (SAT, 3SAT, Clique, Vertex Cover, Set Cover, Hamiltonian Cycle).

FOR FURTHER READING

Approximation algorithms for known NP hard problems - In approximability.

Reference(s)

- 1. S. Dasgupta, C. Papadimitrou, U Vazirani, Algorithms, McGrawHill., 2017.
- 2. J. Klienberg and E. Tardos, Algorithm Design, Pearson Education, 2013.
- 3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, Third Edition, Prentice-Hall, 2011
- Michael T Goodric and Roberto Tamassia, Algorithm Design: Foundations, Analysis and Internet 4. Examples, John Wiley and Sons, 2002.

10 Hours

9 Hours

9 Hours

9 Hours

8 Hours

21SE13 ENTERPRISE SOFTWARE
DEVELOPMENT FRAMEWORK3003

Course Objectives

- Acquaint the basic principles of organization and operation of enterprise-scale software development.
- Understand the state-of-the-art models, methodologies, and technologies used for enterprise-scale software system development
- Apply the current IDEs, intended for practical enterprise-scale software system development in teambased, interactive conditions.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Interpret the fundamental properties of components, technology, architecture and middleware.
- 2. Develop an application that provides business solutions using EJB (System level services)
- 3. Design a framework to deploy servlet and JSP applications using MVC architecture
- 4. Design a Java application exploring Spring and Hibernate modules and architecture.
- 5. Design a.net framework based application to deploy .net based enterprise software.

UNIT I

INTRODUCTION

Software components, Objects, Modules, Interfaces, Callbacks, Directory Services, Component Architecture-Disciplines, Perspectives, and Requirements, Component and Middleware

UNIT II

ENTERPRISE JAVA BEAN

Architecture, Component type-Session and Entity beans, Container services, Stateless session bean, Stateful Session bean, Singleton Session Beans, Message Driven Beans, EJB and Persistance, JPA QL, Entity Callbacks, and Listeners.

UNIT III

STRUTS

STRUT Framework- Architecture, Components, Actions, ActionForms, Configuring Struts and Building Struts enabled JSP, Struct Custom Tag Libraries, Internationalization, Struts Packages and Extensions, Tiles and Validator.

9 Hours

9 Hours

UNIT IV

SPRING AND HIBERNATE

Set up Routine Foran Enterprise Spring Application, Micro Service Architecture with Spring MVC, Spring JDBC, Hibernate Architecture, Hibernate Web Application, Inheritance Mapping, Collection Mapping, Association Mapping, Hibernate Caching, Integrating with Struts and Spring

UNIT V

.NET ENTERPRISE SERVICES

Introducing .NET Enterprise Services, Object Activation and Context, Concurrency,COM Interop, Networking and Data access, Transaction Services

FURTHER READING

JAKARTA Enterprise Javabeans, Future oF Enterprise Distributed Applications

Reference(s)

- 1. Clemens Szyperski, Component Software Beyond Object-Oriented Programming, Pearson Education Publishers, 2011.
- 2. Jonathan Wetherbee, Raghu Kodali, Chirag Rathod, Peter Zadrozny, Beginning EJB 3, Apress, 2018.
- 3. J. Scott Stanlick ,Spring Next Generation Aspect Oriented Programming, CreateSpace Independent Publishing Platform ,2019
- 4. Alex Bretet, Spring MVC Cookbook, Packt Publishing Ltd., Feb 2016. Christian Bauer, Gavin King, Java Persistance with Hibernate, Dreamtech Press, Nov 2015.
- 5. Christian Nagel, Enterprise Services with .NET framework, Addison Wesley, 2015.

21SE14 SOFTWARE ANALYSIS AND DESIGN 3003

Course Objectives

- Interpret the software life cycle models in the development of projects.
- Design a reliable project by gathering the requirements and allow it to work in cross functional mode.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. Design a solution to a given problem using common lifecycle processes.
- 2. Construct a data flow diagram which demonstrates the software requirements and formal specifications of the software systems.
- 3. Implement the design strategies and models for building real time systems.
- 4. Design and motivate software architecture for large-scale software systems.
- 5. Exemplify software design patterns to validate the software design.

9 Hours

9 Hours

UNIT I

SDLC MODELS

Software Engineering Concepts- Development Activities- Software Lifecycle Models: Classical Waterfall Model-V-Model - Incremental Model-Spiral Model-WINWIN Spiral Model-Prototyping Model- Evolutionary Model - Concurrent Model- RAD Model- Agile Model- Specialized Process Model: Component Based Development- Formal Methods Model- Aspect Oriented Software Development. Unified Process Model.

UNIT II

SOFTWARE REQUIREMNT SPECIFICATION

Requirement Analysis and Specification- Requirement Gathering and Analysis- Software Requirement Specification- Formal System Specification-Data Modelling: ER Diagram- Functional Modelling: Data Floe Diagram- Behavioral Modelling: State Transition Diagram- Scenario Based Modelling- UML Model- Class Responsibility Modelling.

UNIT III

DESIGN STRATEGIES AND MODELS

Design Strategies: Top down and Bottom up- Organizational Methods and Design- Jackson Structured Programming - Jackson System Development. Design Models: Object- based Design and Structured System Analysis and Structured Design Method- Traditional Approach to Design - SADT Organization Design Practices - SSADM and Design for Real Time Systems.

UNIT IV

SOFTWARE ARCHITECTURE

Software Architecture- Definition Prospects- State of Art- Architectural Styles - Pipes and Filters - Layered Systems-Repositories- Process Control, Other Familiar Architecture Heterogeneous Architectures. Architecture Design- Introduction shared Information System, Architecture Structures for Shared Information Systems, Architecture Design Guidance- User Interface Architecture.

UNIT V

SOFTWARE ARCHITECTURE PATTERNS

Introduction to Design Pattern Architectural Design and Mapping- Description of Various Architectural Design Patterns- Emerging Trends in Architecture and Design- Tools for Architectural Design Exploiting Style in Architectural Design- Architectural Interconnection.

FOR FURTHER READING

Web App Design Model, Mobile App Design Model

Reference(s)

- 1. Roger S. Pressman, Bruce R. Maxin, Software Engineering- A Practitioner's Approach, Tata McGraw Hill Education, Eighth Edition(2019 Reprint)
- Roger S. Pressman, Software Engineering- A Practitioner"s Approach, Tata McGraw Hill Education, 2. Eighth Edition(2019 Reprint)
- 3. Ian Sommerville, Software Engineering, 9th Edition, 2011(Reprint)
- 4. James F. Peters, Witold Pedrycz, Software Engineering: An Engineering Approach, John Wiley & Sons Inc, 9th Edition, 2000(Reprint)
- Grady Booch Robert A, Maksimchuk Michael W, Engle Bobbi J, Young, Ph.D, Jim Conallen Kelli A. 5. Houston, Object Oriented Analysis and Design with Applications, Addison-Wesley, Third Edition, 2007.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

21SE16 ADVANCED DATA STRUCTURES AND 0042 ALGORITHMS LABORATORY

Course Objectives

- Design data structures and algorithms to solve computing problems ٠
- Design algorithms using graph structure and various string matching algorithms to solve a practical • application
- Apply suitable design strategy for problem solving •

Programme Outcomes (POs)

c. Students should be 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. e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Implement the sorting algorithm using java
- 2. Develop applications using hierarchical data structures using java
- 3. Implement graph algorithms to solve network related problems using java
- 4. Implement the Problem Elements of the Greedy Strategy and Huffman Coding algorithm using java.
- 5. Develop applications that solves NP complete problems using java

1 EXPERIMENT 1 Implement the Merge Sort and Quick Sort-Algorithms.	5 Hours
2 EXPERIMENT 2 Implement the Binary Search Tree	6 Hours
3 EXPERIMENT 3 Implement the Red-Black Tree	5 Hours
4 EXPERIMENT 4 Implement the Heap Implementation	5 Hours
5 EXPERIMENT 5 Implement the Eikenessi Heep Implementation	5 Hours

Implement the Fibonacci Heap Implementation

6 EXPERIMENT 6 Implement the Graph Traversals	6 Hours
7 EXPERIMENT 7 Implement the Spanning Tree Implementation	6 Hours
8 EXPERIMENT 8 Implement the Shortest Path Algorithms (Dijkstra's algorithm, Bellmann Ford Algorithm)	5 Hours
9 EXPERIMENT 9 Implement the Matrix Chain Multiplication	6 Hours
10 EXPERIMENT 10 Implement the Activity Selection and Huffman Coding Implementation	6 Hours
11 EXPERIMENT 11 Implement the Travelling Salesman Problem	5 Hours Total: 60 Hours

21SE17 SOFTWARE DESIGN AND
DEVELOPMENT LABORATORY0 0 4 2

Course Objectives

- To provide a deep insight into the importance of project planning in the software industry
- To understand the software life cycle phases (Project Management, Requirements Engineering, Software Design and Testing) and to get familiar with the usage of CASE tools and Unified Modeling Language (UML)
- The Software Project Development will facilitate the students to develop a preliminary yet practical understanding of software development process and tools

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the basics of software engineering, processes, models and practices
- 2. Understand software requirement engineering and its application using various models
- 3. Analyze risk factors, risk identification, risk projection, Risk refinement, risk management and dealing with change management, survey few tools for configuration management
- 4. Apply testing and its theoretical background along with metrics to test source code, applications and maintenance of application

1

OVERVIEW ABOUT SCRUM PROCESS

-Use open source tools to prepare an agile road map and apply the agile scrum framework and deploy the projects

-Create User stories and issues, plan sprints and distribute tasks across your software team

-Prioritize and discuss your team's work in full context with complete visibility

-Enrich with confidence and sanity knowing the information you have is always up-to date -Improve team performance based on real-time, visual data that your team can put to use

2	6 Hours
EXPERIMENT 2	
Airline Reservation System	
3	6 Hours
EXPERIMENT 3	
Post Office Management System	
4	6 Hours
EXPERIMENT 4	
Online Polling System Project	
5	6 Hours
EXPERIMENT 5	
Power Billing System Project Report	
6	6 Hours
EXPERIMENT 6	
Stock Management System	
7	6 Hours
EXPERIMENT 7	
Crime Records Management System	
8	6 Hours
EXPERIMENT 8	

E-Bus pass Registration And Renewal System Project

9

EXPERIMENT 9

Smart Card-One Nation One Ration Card

10

EXPERIMENT 10 Mobile grocery stores **6 Hours**

6 Hours

Total: 60 Hours

21SE21 SOFTWARE RELIABILITY AND TESTING 3003

Course Objectives

- To gain basic knowledge about metrics, measurement theory and related terminologies •
- To learn measure the quality level of internal and external attributes of the software product •
- To introduce the basics of software reliability and to illustrate how to perform planning, executing and • testing for software reliability
- To explore various metrics and models of software reliability
- To compare various models of software reliability based on its application

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Identify various software metrics, which determines the quality level of software.
- 2. Compare and Pick out the right reliability model for evaluating the software.
- 3. Design new metrics and reliability models for evaluating the quality level of the software based on the requirement.
- Evaluate the quality level of internal and external attributes of the software product. 4.
- 5. Evaluate the reliability of any given software product.

UNIT I

SYSTEM RELIABILITY

Review of Reliability Mathematics - Reliability Block diagram- System Reliability- Repairable and Non Repairable systems- Maintainability and Availability- MTBF- MTTF- MDT- MTTR- Designing for higher reliability-Redundancy-k out of n systems.

UNIT II

EVOLUTION OF SOFTWARE RELIABILITY MODELS

Basic Concepts:Software vs Hardware Reliability-Failure and Faults-Introduction to Software Reliability Growth Models (SRGMs)-General Model Characteristic- Model Classification scheme-white box and black box models-models for application during operational phase and testing phase-Okumoto imperfect debugging model

UNIT III

NONHOMOGENEOUS POISSON PROCESS (NHPP) MODELS

Stochastic process-Counting Process-Execution time-Testing time and Calendar Time modeling-Musa models-Basic Execution time-Okumoto Logarithmic Poisson Execution time models-NHPP models - Yamada delayed S-shaped model.

UNIT IV

FLEXIBLE AND QUALITY METRICS PRODUCING MODELS

Flexible models- Kapur- Garg model, Subburaj-Gopal model for the learning phenomenon, Subburaj-Gopal-Kapur versatile debugging model -Failure Data-Parameter estimation-Use of tools - Predictive Validity of Models:short term and long term

UNIT V

COMPARISON OF SOFTWARE RELIABILITY MODELING

Bayesian models-Littlewood-Verrall model-Discrete models-Efforts based models; Execution time-Testing time and Release Time determination-cost-failure intensity-reliability-Comparison Criteria: Goodness of fit-Predictive Validity of Models-short term and long term

FOR FURTHER READING

CASRE software: Creating the failure data file for CASRE- Executing CASRE - Executing CASRE with Excel to obtain FI/FIO Plots - Interpreting CASRE results.

Reference(s)

- Dr.R.Subburaj, "Software Reliability Engineering", McGrawHill Education, 2015 1.
- 2. Fatemeh Afsharnia (2017). Failure Rate Analysis, Failure Analysis and Prevention, Aidy Ali, IntechOpen, DOI: 10.5772/intechopen.71849. Available from: https://www.intechopen.com/books/failure-analysisand-prevention/failure-rate-analysis.
- 3. Patric D.T.O Connor,"Practical Reliability Engineering",5th Edition, John Wesley&sons,2012
- P.K.Kapur,H.Pham,A.Gupta,P.C.Jha,"Software Reliability Assessment with OR Applications", Springer 4. 2011
- 5 John D.Musa, Anthony Iannino, Kazuhira Okumoto, "Software Reliability -Measurement, Prediction, Application, Series in Software Engineering and Technology", McGrawHill, 1987
- Michael Lyu,"Handbook of Software Reliability Engineering", IEEE Computer Society Press, ISBN:0-07-6. 039400-8,2005

9 Hours

9 Hours

9 Hours

9 Hours

21SE22 AGILE SOFTWARE DEVELOPMENT 3003

Course Objectives

- To provide students with a theoretical as well as practical understanding of agile software development practices
- To understand the Agile Scrum framework and development practices.
- To apply software design principles and refactoring techniques to achieve agility.
- To understand Agile testing methodologies and perform testing activities within an agile project.
- To understand the benefits and pitfalls of working in an Agile team in terms of quality assurance.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand genesis of Agile and driving forces for choosing Agile techniques
- 2. Apply the Agile Scrum framework and development practices.
- 3. Apply iterative software development processes by planning and executing them.
- 4. Analyse the impact of the success of social aspects behind the software testing.
- 5. Analyze techniques and tools for improving team collaboration and management.

UNIT I

AGILE METHODOLOGY

Agility and the Cost of Change, Agility Principles, The Politics of Agile Development, Extreme Programming, The XP Process, Twelve Practices of XP, Industrial XP, Other Agile Process Models, Scrum, Dynamic Systems Development Method, Agile Modeling, Agile Unified Process, A Tool Set for the Agile Process

UNIT II

AGILE SCRUM FRAMEWORK

Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles, Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management.

UNIT III

AGILE SOFTWARE DESIGN AND DEVELOPMENT

Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control.

9 Hours

9 Hours

UNIT IV

AGILE TESTING

The Agile lifecycle and its impact on testing, Test Driven Development (TDD), Testing user stories, Acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester.

UNIT V

TOOLS FOR AGILE PROJECT MANAGEMENT

Specialized agile software, practical implications: Expense structure, staff issues, market implications. Extended agile case study: Implementation, Tracking Program, Support from management, Scaling the budget and refining the process.

FURTHER READING

Case Study: The weather station case study, The payroll case study and the ETS case study

Reference(s)

1. Ken Schwaber, Mike Beedle, Agile Software Development with Scrum, Pearson, 2014.

- 2. Robert C. Martin, Agile Software Development, Principles, Patterns and Practices Pearson, First Edition 2013.
- 3. Lisa Crispin, Janet Gregory, Agile Testing: A Practical Guide for Testers and Agile Teams Addison Wesley, 2010.
- 4. Roger S Pressman, Software Engineering: A Practitioner Approach, Tata McGraw Hill, Eighth Edition, 2015
- 5. Ed Stark Agile Project Management: QuickStart Guide A Simplified Beginners Guide To Agile Project, Second Edition , by ClydeBank Business - 2017
- 6. Craig Larman, Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2016.

21SE23 ROBOTIC PROCESS AUTOMATION 3 0 2 4

Course Objectives

- Understand the concept of software automation of the day to day activities performed using RPA Tools.
- Perform analysis on the information retrieved from various sources that fits the requirement of the application.

Programme Outcomes (POs)

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

1. Understand the basic principles of software automation and different types of applications that are integrated with automation.

9 Hours

9 Hours

- 2. Develop applications based on various Planning and process methodology to automate the tasks that are to be performed repeatedly.
- 3. Develop a software BOT with integration with different input sources based on the process requirement.
- 4. Apply debugging and exception handling techniques to perform application without error during the execution.
- 5. Apply BOT Insight to implement the artificial intelligence techniques in software automation.

UNIT I

RPA FOUNDATION

RPA: History, Benefits, Comparison - RPA Skills: On-Premise Vs Cloud, Web Technology, Optical Character Recognition, Databases, Application Programming Interfaces.

UNIT II

PROCESS METHODOLOGY AND PLANNING

Lean - Six Sigma - Implementation of Six Sigma - Roles and Levels in Six Sigma - Lean Six Sigma - Applying Lean and Six sigma in RPA - Planning: ROI for RPI, Use Cases of RPA.

UNIT III

BOT DEVELOPMENT

Introduction - Recorders - Smart Recorders - Web Recorders - Screen Recorders - Task Editor - Variables -Command Library - Loop Command - Excel Command - Database Command - String Operation Command -XML Command - Terminal Emulator Command - PDF Integration Command - FTP Command - PGP Command - Object Cloning Command.

UNIT IV

EXCEPTION HANDLING, DEBUGGING AND LOGGING

Assistant bots: Monitoring system event triggers, Monitoring image and element triggers - Exception handling - Exception handling Commands - Logging - Debugging techniques - Collecting crash dumps - Error reporting.

UNIT V

META BOT AND BOT INSIGHT

Introduction - MetaBot Designer - MetaBot With AI Sense - Bot Insight -Transactional Analytics - Operational Analytics - Course Key Points.

FOR FURTHER READING

Deploying and Maintaining the BoT - Orchestration Server - Orchestration Server to control bots - License management - Publishing.

1

EXPERIMENT 1

Software Installation Procedure - Installation of AA Control Room, SQL Server and AA Client

2

EXPERIMENT 2

Bot Creation using recorders (Smart, Web and Screen)

6 Hours

9 Hours

12 Hours

9 Hours

9 Hours

3 Hours

3 EXPERIMENT 3 Bot Creation using command library - (Loop Command)	3 Hours
4 EXPERIMENT 4 Bot Creation to invoke database automation	3 Hours
5 EXPERIMENT 5 Bot Creation for automating excel operations	3 Hours
6 EXPERIMENT 6 Bot Creation for PDF Integrations	3 Hours
7 EXPERIMENT 7 Bot Creation and working on error handling	3 Hours
8 EXPERIMENT 8 Bot Development using Object Cloning Command	3 Hours
9 EXPERIMENT 9 FTP and PGB Command Execution by Bots	3 Hours
10 EXPERIMENT 10 MetaBot Designing with AI Sense	3 Hours
Tota Reference(s) 1. Alok Mani Tripathi, Learning Robotic Process Automation UiPath Kindle Edition, 2018. 2. Tom Taulli, Robotic Process Automation Handbook, Kindle Edition, 2020. 3. Richard Murdoch, Robotic Process Automation, 2018.	al: 75 Hours

- 4. Mary C. Lacity and Leslie P. Willcocks, Robotic Process and Cognitive Automation, 2018.
- 5. Lim Mei Ying, Robotic Process Automation with Blue Prism Quick, 2018.

21SE26 SOFTWARE TESTING LABORATORY

Course Objectives

• To apply different design techniques, testing strategies and automate the testing process as a part of developing and deploying software based on software life cycle model.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Apply UML model elements to enable visual representation of the system being developed
- 2. Apply various testing methodologies to design and execute test cases for the problems solved using programming language.
- 3. Apply testing tools to automate various testing methodologies on web application.

1

ER DIAGRAM

Develop an ER diagram for any real time application

2

UML BEHAVIORAL DIAGRAMS

Deploy UML diagrams - Use Case diagram - Sequence Diagram - State chart Diagram - Collaboration Diagram - Activity Diagram for any two real time applications

3

UML STRUCTURAL DIAGRAMS

Deploy UML diagrams - Class diagram - Component Diagram and Deployment Diagram for any two real time applications

4

TEST CASES DESIGN

a. Design, develop, code and run the program in any suitable language to implement the quick sort algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.

b. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on equivalence class partitioning, execute the test cases and discuss the results.

18

12 Hours

12 Hours

12 Hours

0042

5

TESTING TOOLS

- a. Automate 'User Registration' of any E-commerce Website using Selenium Tool
- b. Automate GUI Testing for any E-commerce Website using Selenium Tool
- c. Implement Whitebox testing and code coverage methods such as Statement Coverage, Decision Coverage and Branch Coverage for any program using CodeCover Tool

Total: 60 Hours

21SE51 WIRELESS SENSOR NETWORK 3003

Course Objectives

- Learn various fundamental and emerging protocols of all layers
- Explore the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks
- Understand the nature and applications of Ad-hoc and sensor networks
- Enrich various security practices and protocols of Ad-hoc and Sensor Networks

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. Infer the implications of MAC and TCP protocols designed for wired and wireless ad-hoc/sensor networks
- 2. Infer various network layer protocol design issues of wireless sensor and ad-hoc networks.
- 3. Analyze current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks by considering reference model.
- 4. Apply various defense techniques for the security threats of ad-hoc and sensor networks.
- 5. Implement real-time applications in NS3/SciLab/TinyOS environment and compute various parameters associated with it.

UNIT I

ADHOC NETWORKS FUNDAMENTALS AND MAC PROTOCOLS

Fundamentals of WLANs - Self Configuration and Auto Configuration 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

12 Hours

UNIT II

ADHOC NETWORK ROUTING AND MANAGEMENT

Routing in Ad-Hoc Networks- 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

UNIT III

SENSOR NETWORK FUNDAMENTALS

Introduction - Architecture - Single Node Architecture - Sensor Network Design Considerations - Protocols for WSN- Physical Layer - Transceiver Design Considerations - IEEE 802.15.4 Zigbee - Link Layer and ErrorControl Issues - Routing Protocols - Mobile Nodes and Mobile Robots - Data Centric routing - Transport Protocols - Congestion Control Issues - Application Layer Support

UNIT IV

ADHOC 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 - Broadcast Authentication WSN Protocols - TESLA - Biba - Sensor Network Security Protocols - SPINS

UNIT V

SENSOR NETWORK MANAGEMENT AND PROGRAMMING

Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols -TimeSynchronization - QoS - Localization and Positioning - Operating Systems and Sensor Network Programming - Sensor Network Simulators NS3 - Scilab

FOR FURTHER READING

WSN Network Architecture, WSN routing, OLSR, Localization, Indoor and sensor Network Localization

Total: 45 Hours

Reference(s)

- 1. Carlos De MoraisCordeiro, Dharma Prakash Agrawal, "AdHoc and Sensor Networks Theoryand Applications", Second Edition, World Scientific Publishing, 2011.
- 2. Holger Karl, Andreas willig, "Protocols and Architectures for Wireless Sensor Networks", JohnWiley & Sons, Inc .2007
- 3. C.Siva Ram Murthy and B.S.Manoj, "AdHoc Wireless Networks Architectures and Protocols", Pearson Education, 2018
- 4. C.K.Toh, "AdHoc Mobile Wireless Networks", Pearson Education, 2002
- 5. Erdal Cayirci, ChunmingRong, "Security in Wireless Ad Hoc and Sensor Networks", JohnWiley and Sons, 2009
- 6. WaltenegusDargie, Christian Poellabauer, "Fundamentals of Wireless Sensor NetworksTheory and Practice", John Wiley and Sons, 2010

9 Hours

9 Hours

9 Hours

21SE52 5G NETWORK AND ITS APPLICATION 3003

Course Objectives

- Learn various techniques for High resolution and bi-directional large bandwidth shaping
- Explore the issues pertaining to gather all networks on one platform
- Understand the nature and applications of technological sound to support heterogeneous services (including private network).
- Enrich various security practices to provide uniform, uninterrupted, and consistent connectivity across the world.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. Compare the evolution of 5G, system concepts and spectrum challenges.
- 2. Relate various architecture, Beam forming and hardware technologies for mmW communications.
- 3. Analyze the requirements and fundamental techniques for MTC and D2D Communication.
- 4. Apply various radio access technologies for 5G networks.
- 5. Analyze the fundamentals, resource allocation and transceiver algorithms for Massive MIMO.

UNIT I

DRIVERS FOR 5G

Historical Trend for Wireless Communication Mobile Communications Generations: 1G to 4G Evolution of LTE Technology to Beyond 4G-Pillars of 5G- Standardization Activities -Use cases and Requirements - System Concept -Spectrum and Regulations: Spectrum for 4G-Spectrum Challenges in 5G -Spectrum Landscape and Requirements-Spectrum Access Modes and Sharing Scenarios

UNIT II

5G ARCHITECTURE AND MILLIMETER WAVE COMMUNICATION

5G Architecture: Software-Defined Networking Network Function Virtualization Basics about RAN Architecture High-Level Requirements for 5G Architecture-Functional Architecture and 5G Flexibility-Physical Architecture and 5G Deployment Millimeter Wave Communication: Channel Propagation-Hardware Technologies for mmW Systems-Deployment Scenarios-Architecture and Mobility-Beamforming-Physical layer Techniques

UNIT III

MACHINE TYPE AND D2D COMMUNICATION

MTC: Use cases and Categorization-MTC Requirements Fundamental Techniques for MTC-Massive MTC-Ultra-reliable Low-latency MTC D2D: from 4G to 5G-Radio Resource Management for Mobile Broadband D2D-Multi-hop D2D Communications for Proximity and Emergency Services-Multi-operator D2D Communication

9 Hours

9 Hours

UNIT IV

5G RADIO ACCESS TECHNOLOGIES

Access Design Principles for Multi-user Communications-Multi-carrier with Filtering-Nonorthogonal Schemes for Efficient Multiple Access-Radio Access for Dense Deployments -Radio Access for V2X Communication-Radio Access for Massive Machine-type Communication

UNIT V

MASSIVE MIMO

MIMO in LTE-Single user MIMO-Multi user MIMO-Capacity of Massive MIMO-Pilot Design of Massive MIMO-Resource Allocation and Transceiver Algorithms for Massive MIMO-Fundamentals of Baseband and **RF** Implementation in Massive MIMO-Channel Models

FURTHER READING

5G LAN support for IOT in cloud office - Network slicing

Reference(s)

- 1. Asif Oseiran, Jose F. Monserrat, 5G Mobile and Wireless Communications Technology, Cambridge University Press,2016
- Jonathan Rodriguez, Fundamentals of 5G Mobile Networks, Wiley, 2015 2.
- 3. Patrick Marsch, Omer Bulakci, 5G System Design Architectural and Functional Considerations and Long Term Research, Wiley, 2018
- 4. Benny Bing,5G Technologies and applications,September 2018

21SE53 CYBER SECURITY

Course Objectives

- Identify different types of cybercrime and cyber law •
- Recognized various tools & methods in Cyberline •
- Analyze Indian IT Act 2008 and various security standards. •

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the concept of cybercrime and global Perspective on cybercrimes.
- 2. Understand different forms of hacking techniques and security challenges

9 Hours

9 Hours

Total: 45 Hours

3003

- 3. Apply relevant tools and methods for various Cyber crimes.
- 4. Analyze IT law in various legal issues
- Evaluate Information Security Standards compliance during software design and development 5.

UNIT I

INTRODUCTION TO CYBERCRIME

Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes

UNIT II

CYBER OFFENSES

How criminal plan the attacks, Social Engineering, Cyber stalking, Cyber caf $\hat{A}f\hat{A}$ [©] and Cybercrimes, Botnets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones.

UNIT III

TOOLS AND METHODS USED IN CYBERLINE

Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SOL Injection, Buffer Over Flow, Attacks on Wireless Networks, Identity Theft (ID Theft)

UNIT IV

CYBERCRIMES AND CYBERSECURITY: THE LEGAL PERSPECTIVES

Introduction, Cybercrime and the Legal Landscape around the World, Why Do We Need Cyberlaws: The Indian Context, Indian IT Act 2008, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment.

UNIT V

INFORMATION SECURITY STANDARD COMPLIANCES

Compliance Overview, Major IT Requirements by Regulation, SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI. Common Compliance Reports & Tools.

FOR FURTHER READING

The Intellectual Property Aspect in Cyber Law, Evidence Aspect in Cyber Law

Reference(s)

- Nina Godbole, Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and 1. Legal Perspectives, reprint-2018, Wiley India, New Delhi,.
- 2. Vishwanathan Suresh T, The Indian Cyber Law, 2nd Edition 2001, Bharat Law House.
- 3. Ministry of Law, Justice and Company Affairs (Legislative Department), The Information technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.
- 4. Adv. Prashant Mali, Cyber law & Cyber Crimes- Information Technology Act, 2000 with IT Rules, 2nd Edition August 2015, Snow White Publications Pvt. Ltd.
- 5. Charles P. Pfleeger and Shari Lawrence Pfleeger, Security in Computing, 5th Edition, January 2015, Pearson Publication.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

6. Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, 2017 Wiley India, New Delhi.

21SE54 DEVOPS TOOLS AND TECHNOLOGIES 3003

Course Objectives

- Describe the need for DevOps in Software development.
- Develop software projects using Jenkins and GIT and Ansible tools.
- Use the Docker tool to deliver software in packages called containers.

Programme Outcomes (POs)

c. Students should be 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. e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the basics of DevOps for fast and reliable Software Development.
- 2. Apply jenkin tool to build and test the software projects
- 3. Develop repositories in GIt to keep track of version control.
- 4. Apply Ansible tool to perform configuration management, application deployment, intraservice orchestration, and provisioning.
- 5. Apply Docker to separate applications from infrastructure to deliver software quickly.

UNIT I

INTRODUCTION

Devops Introduction - DevOps and Software Development Life Cycle : Waterfall Model and Agile Model - Evolution of Cloud Computing : IAAS ,SAAS , PAAS Private, Public and Hybrid Clouds - Linux Administration and Shell Scripting.

UNIT II

CONTINUOUS INTEGRATION WITH JENKINS

Continuous Integration with Jenkins - Configure Jenkins -Jenkins Management - Scheduling - Maven Build Scripts - Support for the GIT version control System - JOBS - Jenkins Builds - Plugins - Securing Jenkins

UNIT III

GIT AND MAVEN

GIT Features - 3-Tree Architecture-GIT - Clone, Commit, Push - Project managements - Build tool - Maven - Build requirements - Maven POM Builds pom.xml - Build Life Cycle - repository Maven Dependencies - Maven Plugins

9 Hours

9 Hours

UNIT IV

ANSIBLE

Introduction - Ansible Server Configuration - Infrastructure Management SSH Connection in Ansible Master - YAML Scripts - Host Inventory - Ad-hoc Commands -Playbooks - Modules - Ansible Roles.

UNIT V

DOCKER

Docker Introduction- Docker Installation- Docker Containers - Docker Command Line Interphase- Compose-Hub - Trusted Registry - swarm - attach - File & Commands

FURTHER READINGS

Amazon AWS, Google Cloud Services - Microsoft Azure

Reference(s)

- Liming Zhu, Ingo M. Weber, Len Bass ,DevOps: A Software Architect's Perspective (SEI Series in 1. Software Engineering), Addison-Wesley; 1st edition 2015
- 2. Gene Kim, Patrick Debois, Professor John Willis, Jez Humble, The DevOPS Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, : IT Revolution Press, 2017
- David Farley Jez Humble ,Continuous Delivery: Reliable Software Releases through Build, Test, and 3. Deployment Automation, 2018
- Nicole Forsgren Phd, Jez Humble, Gene Kim, Accelerate: The Science of Lean Software and Devops: 4. Building and Scaling High Performing Technology Organizations, IT Revolution Press, 2018

21SE55 SOFTWARE REVERSE ENGINEERING 3003

Course Objectives

- To provide a broad introduction to Reverse Engineering and their programming •
- To explain and apply the fundamental concepts and terminology of Reverse Engineering. •
- To explain and address the fundamental problems of Reverse Engineering. •

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- Identify the scope of reverse engineering in software development. 1.
- 2. Classify low level and high level programming aspects for reverse engineering.
- 3. Use Reversing Tools for applications.

9 Hours

9 Hours

- 4. Interpret protection breaking, cracking and disassembly processes.
- 5. Apply object oriented approach for reverse engineering using a programming paradigm.

UNIT I

FOUNDATIONS OF REVERSE ENGINEERING

Reverse Engineering, Software Reverse Engineering, Reversing Applications, Goals of reverse engineering and Steps of Software Reverse Engineering

UNIT II

LOW LEVEL SOFTWARE AND WINDOWS FUNDAMENTALS

Reversing process, Low Level Software-High-Level perspectives, Low level perspectives, Assembly language, A primer on compilers and compilation, Execution Environments

UNIT III

REVERSING TOOLS

Reversing Approaches, Disassemblers, Debuggers, Decompilers, System -Monitoring Tools, Patching Tools, Miscellaneous Reversing Tools

UNIT IV

CRACKING AND DISASSEMBLY

Piracy and copy protection, Anti Reversing techniques, Breaking protections, Reversing.Net, Decompiling classes, Obfuscating classes

UNIT V

OBJECT ORIENTED CODE

Accessing Non-Public methods and variables of a class, Replacing and patching Application classes, Manipulating java security, Reverse engineering applications, Intercepting Control flow, Software Production.

FURTHER READINGS

Version control using Git repository - Reverse engineering attacks and tools for cybersecurity

Reference(s)

- 1. Eldad Eilam Reversing Secrets of Reverse Engineering, Wiley Publishing, Inc, 2011.
- 2. Alexandre Gazet, and Elisas Bachallany ,Practical Reverse Engineering X86, X64,ARM, Windows, Kernel, Reversing Tools and Obfuscation by Bruce Dang, Wiley 2014.
- 3. Paolo Tonella, Alessandra Potrich ,Reverse Engineering of Object Oriented Code by Springer Science 2005.
- 4. Covert Java Techniques for Decompiling, Patching and Reverse Engineering by Alex Kalinovsky, SAMS Publishing 2004.

9 Hours

Total: 45 Hours

9 Hours

9 Hours

9 Hours

21SE56 HUMAN COMPUTER INTERFACE 3003

Course Objectives

- To learn about designing the user interfaces considering human and computer capabilities and constraints. •
- To understand the user-centered design and usability principles. •
- To Know about Web UI design principles.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the usability levels for interactive systems.
- 2. Apply the design development methodologies involved in user interface.
- 3. Develop skills in handling virtual environments and its exploitation.
- 4. Apply the diverse input methods available for interfacing
- 5. Analyse the different types of Information Search and Visualization Techniques.

UNIT I

INTRODUCTION

Goals of System Engineering, Goals of User Interface Design, Usability Motivations, High Level Theories, Object Action Interface Model, Principles, Guidelines for navigating the interface, organizing the display, getting the users attention.

UNIT II

DEVELOPMENT PROCESSES

Introduction, Organizational Design to Support Usability, The Three Pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact Statement for Early Design, Legal Issues-Expert Reviews, Usability Testing and laboratories, Surveys, Acceptance tests, Evaluation during Active use.

UNIT III

INTERACTION STYLES

Direct Manipulation and Virtual Environments: Introduction, Examples, Discussion, Menu Selection, Form Fillin, and Dialog Boxes: Task-Related Menu Organization, Fast Movement Through Menus, Command and Natural Languages: Functionality to Support Users Tasks, Command-Organization Strategies, Benefits, Naming and Abbreviations, Natural Language in Computing

9 Hours

27

9 Hours

UNIT IV

INTERACTION DEVICES

Introduction, Keyboards and Functions, Pointing Devices, Speech recognition, Digitization and Generation, Image and Video Displays, Printers, Theoretical Foundations, Expectations and Attitudes, User Productivity, Variability, Error messages, Non anthropomorphic Design, Display Design, color, Reading from Paper versus from Displays, Preparation of Printed Manuals, Preparation of Online Facilities.

UNIT V

INFORMATION SEARCH AND VISUALIZATION

Introduction, Individual Window Design, Multiple Window Design, Coordination by Tightly Coupled Window- Image Browsing, Personal Role Management and Elastic Windows Goals, Asynchronous Distributed Interfaces, Synchronous Distributed Interfaces, Face to Face, Applying Computer Supported Cooperative Work to Education, Search in Textual Documents and Database Querying, Multimedia Documents Searches, Advance Filtering and Search Interfaces, Information Visualization.

FOR FURTHER READING

Modeling Rich Interaction, Group ware.

Total: 45 Hours

3003

Reference(s)

- 1. Ben Shneiderman, Catherine Plaisant, "Designing the User Interface", 6th Edition, Pearson, 2017.
- 2. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, "Human Computer Interaction ", Pearson, 2010.
- 3. Jonathan Lazar, Jinjuan Heidi Feng, "Research Methods in Human Computer Interaction", Morkan Kaufmann,2017
- 4. Wilbert O Galitz,"The Essential guide to User Interface Design", 2nd Edition, Wiley India, 2009.
- 5. Jef Raskin, "The Human Interface", AddisonWesley 2000.

21SE57 DATA SCIENCE USING R

Course Objectives

- Understand the fundamental algorithmic concepts of data science.
- Implement data analytics concepts using R
- Apply the different types of modeling methods for analyzing the data
- Deploy the visualization techniques to predict the future set

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

9 Hours

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the fundamental concepts of data science.
- 2. Analyze 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

INTRODUCTION TO DATA SCIENCE

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

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

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

MAP REDUCE

Introduction distributed file system algorithms using mapreduce, MatrixVector 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

DATA VISUALIZATION

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 one window exporting graph using graphics parameters. Case studies

FURTHER READING

Decision Tree in R, R Random Forest, Generalized Linear Model, R Vs Python

Reference(s)

- 1. Nia Zumel and John Mount, Practical Data Science with R, Manning Publications, 2019.
- 2. Hadley Wickham and Garett Grolemund, R for Data Science, O Reilly, 2017
- 3. Jure Leskovec, Anand Rajaraman and Jeffrey D. Ullman, Mining of Massive Datasets, Cambridge University Press, Third Edition 2020.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

- 4. Boris Lubinsky, Kevin T. Smith, and Alexey Yakubovich, Professional Hadoop Solution, Wiley, 2015.
- 5. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort and Abhijit Dasgupta, Practical Data Science Cookbook, Packt Publishing Ltd., 2017.
- 6. htt ps://r4ds.had.co.nz/transform.html.

21SE58 SOCIAL NETWORK ANALYSIS 3003

Course Objectives

- Interpret the emerging need of social network analysis and their various representations. •
- Apply various community detection techniques in social network analysis. •
- Apply various visualization techniques for small and large data.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. Apply knowledge for current web development in the era of Social Web.
- 2. Develop a model for integrating data for knowledge representation.
- 3. Apply the tools and an algorithm for mining in social networks.
- 4. Examine the human behavior and trust disputes of social networks.
- 5. Apply visualization technique in Social networks.

UNIT I

INTRODUCTION TO SOCIAL NETWORK ANALYSIS

Introduction to Web: Limitations of current Web- Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities. Web-based networks.

UNIT II

UNIT III

MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION

Ontology languages for the Semantic Web: RDF and OWL - Modelling and aggregating social network data: State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced Representations.

EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS

Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social

9 Hours

9 Hours

8 Hours

30

Networks: Definition of Community - Evaluating Communities - Methods for Community Detection-Applications of Community Mining Algorithms - Tools for Detecting Communities Social Network Infrastructures and Communities - Decentralized Online Social Networks: Introduction- Challenges for DOSNs- General purpose DOSNs.

UNIT IV

PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES

Understanding and Predicting Human Behavior for Social Communities - User Data Management- Inference and Distribution - Enabling New Human Experiences: Reality Mining - Context Awareness - Privacy in Online Social Networks: Trust in Online Environment - Trust Models Based on Subjective Logic - Trust Network Analysis - Trust Transitivity Analysis - Combining Trust and Reputation - Trust Derivation Based on Trust Comparisons.

UNIT V

VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

Graph Theory- Centrality- Clustering - Node-Edge Diagrams, Matrix representation, Visualizing Online Social Networks - Visualizing Social Networks with Matrix-Based Representations: Matrix and Node-Link Diagrams - Hybrid Representations - Applications of social network analysis: Covert Networks - Community Welfare - Collaboration Networks.

FURTHER READING

A Case Study on the Twitter-Applications - Cover networks - Community welfare

Reference(s)

- 1. Gerardus Blokdyk ,Social Network Analysis A Complete Guide 2020 Edition.
- 2. George Ritzer Wendy Wiedenhoft Murphy, Social Network Analysis, 2019.
- 3. Nilanjan Dey, Samarjeet Borah, Rosalina Babo, Amira S. Ashour, " Social Network Analytics : Computational Research Methods and Techniques ", 1st Edition, Elsevier (Academic Press), 2018.
- 4. John Scott ,Social Network Analysis, 2017, SAGE Publications Ltd.

21SE59 MACHINE LEARNING TECHNIQUES 30

Course Objectives

- To introduce students to the basic concepts and techniques of Machine Learning
- To have a understanding of the Supervised and Unsupervised learning techniques
- To study the various probability based learning techniques
- To understand graphical models of machine learning algorithms

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be able to demonstrate a degree of mastery over the area as per the specialization of the

10 Hours

9 Hours

Total: 45 Hours

3003

program. The mastery should be at a level higher than the requirements in the appropriate bachelor program. d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. To understand the supervised, unsupervised and semi-supervised learning models.
- 2. Apply the appropriate machine learning strategy for any given problem.
- 3. Design systems that use the appropriate Trees in Probabilities Models of machine learning.
- 4. Analyze the existing machine learning algorithms to improve classification efficiency.
- 5. Design systems that use the appropriate graph models of machine learning.

UNIT I

INTRODUCTION

Learning - Types of Machine Learning - Supervised Learning - The Brain and the Neuron -Design a Learning System - Perspectives and Issues in Machine Learning - Concept Learning Task - Concept Learning as Search - Finding a Maximally Specific Hypothesis - Version Spaces and the Candidate Elimination Algorithm - Linear Discriminants - Perceptron - Linear Separability - Linear Regression

UNIT II

LINEAR MODELS

Multi layer Perceptron - Going Forwards - Going Backwards- Back Propagation Error - Multilayer Perceptron in Practice - Examples of using the MLP - Overview - Deriving Back Propagation - Radial Basis Functions and Splines - Concepts -RBF Network - Curse of Dimensionality Interpolations and Basis Functions - Support Vector Machines.

UNIT III

TREE AND PROBABILISTIC MODELS

Learning with Trees - Decision Trees - Constructing Decision Trees - Classification and Regression Trees -Ensemble Learning - Boosting - Bagging - Different ways to Combine Classifiers - Probability and Learning - Data into Probabilities - Basic Statistics - Gaussian Mixture Models - Nearest Neighbor Methods -Unsupervised Learning - K Means Algorithm - Vector Quantization - Self Organizing Feature Map.

UNIT IV

DIMENSIONALITY REDUCTION AND REVOLUTIONARY MODELS

Dimensionality Reduction - Linear Discriminant Analysis - Principal Component Analysis - Factor Analysis - Independent Component Analysis - Locally Linear Embedding - Isomap - Least Squares optimization -Evolutionary Learning - Genetic Algorithms - Genetic Offspring - Genetic Operators - Using Genetic Algorithms - Reinforcement Learning - Overview - Getting Lost Example - Markov Decision Process

UNIT V

GRAPHICAL MODELS

Markov Chain Monte Carlo Methods - Sampling - Proposal Distribution - Markov Chain Monte Carlo -Graphical Models - Bayesian Networks - Markov Random Fields - Hidden Markov Models - Tracking Methods

9 Hours

9 Hours

9 Hours

9 Hours

Total: 45 Hours

3003

Syllabi: M.E. Software Engineering| Minimum Credits to be earned: 68| Regulations 2021

FOR FURTHER READING

Deep Learning Platform, Generative Adversarial Networks, Adversarial machine learning

Reference(s)

- 1. Ethem Alpaydin, "Introduction to Machine Learning 3s (Adaptive Computation and MAchine Learning Series)", Third Edition, MIT Press, 2014
- 2. Jason Bell, "Machine learning Hands on for Developers and Technical Professionals" ,First Edition, Wiley, 2014
- 3. Peter Flach, "Machine learning: The Art and Science of Algorithms that MAke sense of Data", First Edition, Cambridge University Press, 2012
- 4. Stephen Marsland, "Machine Learning An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014
- 5. Tom M Mitchell, "Machine Learning", First Edition, McGraw Hill Education, 2013

21SE60 DEEP LEARNING

Course Objectives

- To present the mathematical, statistical and computational challenges of building stable representations for high-dimensional data, such as images, text and data
- To develop into selected topics of Deep Learning, discussing recent models from both supervised and unsupervised learning
- Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Explain the evolution of deep neural networks and the potential of such networks in automatic learning.
- 2. Analyze the need for deep learning algorithms which are more appropriate for different types of learning tasks in various domains
- 3. Apply convolutional architectures for unsupervised learning and solve real time problems.
- 4. Analyze various types of recurrent neural networks and apply their potential in different domains.
- 5. Implement deep learning algorithms and solve real-world problems.

34

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021

UNIT I

INTRODUCTION

Biological Neuron, Idea of computational units, McCulloch Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability, Convergence theorem for Perceptron Learning Algorithm, Feedforward Networks Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, autoencoders

UNIT II

DEEP NEURAL NETWORKS

Difficulty of training deep neural networks, Greedy layerwise training. Better Training of Neural Networks Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization)

UNIT III

RECURRENT NEURAL NETWORKS

Backpropagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, **Bidirectional RNNs**

UNIT IV

CONVOLUTIONAL NEURAL NETWORKS AND GENERATIVE MODELS

Architectures, convolution / pooling layers LeNet, AlexNet, Generative model Restricted Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines

UNIT V

RECENT TRENDS AND APPLICATIONS

Recent trends Variational Autoencoders, Generative Adversarial Networks, Multi task Deep Learning, Multi view Deep Learning, Applications: Vision, NLP, Speech.

FOR FURTHER READING

Computer Vision, Supervised Machine Learning, Unsupervised Machine Learning

Reference(s)

- 1. 1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
- 2 2. Bengio, Yoshua, Learning deep architectures for AI, Foundations and trends in Machine Learning 2.1 (2009) 1127
- 3. Abadi, Tensor flow Large-scale machine learning on heterogeneous distributed systems, arXiv preprint 3. arXiv1603.04467 (2016).
- 4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw Hill Education, 2020 4.
- 5. 5. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2019.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours
21SE61 DIGITAL IMAGE PROCESSING 3003

Course Objectives

- Understand the basic principles of digital images processing and transformations.
- Apply the enhancement algorithms to improve the quality of images.
- Apply the restoration techniques to recover the original images.
- Implement the coding process to perform image compression with coloring models.
- Demonstrate a meaningful image using segmentation and representation algorithms.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the basic principles of digital images processing and transformations.
- 2. Apply the enhancement algorithms to improve the quality of images.
- 3. Apply the restoration techniques to recover the original images.
- 4. Implement the coding process to perform image compression with coloring models.
- 5. Demonstrate a meaningful image using segmentation and representation algorithms.

UNIT I

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

Elements of visual perception - Image sampling and quantization - Basic relationship between pixels - Basic geometric transformations -Introduction to Transform - Discrete Cosine Transform - Discrete Fourier Transform (DFT) - Fast Fourier Transform(FFT) - Wavelet Transforms- DWT and CWT -Curvelets.

UNIT II

IMAGE ENHANCEMENT TECHNIQUES

Spatial Domain methods Basic grey level transformation -Histogram equalization -Image subtraction - Image averaging -Spatial filtering Smoothing, sharpening filters - Laplacian filters - Frequency domain filters Smoothing - Sharpening filters - Homomorphic filtering.

UNIT III

IMAGE RESTORATION

Model of Image Degradation/restoration process - Noise models - Inverse filtering -Least mean square filtering -Constrained least mean square filtering - Blind image restoration-Pseudo inverse - Singular value decomposition.

9 Hours

9 Hours

UNIT IV

IMAGE COMPRESSION AND COLOR MODELS

Lossless compression Variable length coding - LZW coding - BIT plane coding- predictive coding-DPCM. Lossy Compression Transform coding - Wavelet coding - Basics of Image compression standards JPEG2000, MPEG. Color Models -pseudo Color Image processing.

UNIT V

IMAGE SEGMENTATION AND REPRESENTATION

Point, Line and Edge detection - Thresholding - Global- Otsus Method - Multiple and Variable Thresholding - Region Based segmentation. Boundary representation chair codes- Polygonal approximation - Boundary segments - Boundary descriptors Simple descriptors -Fourier descriptors - Regional descriptors -Simple descriptors - Texture - Moment Invariants.

FURTHER READING

Morphological Image Processing-Wavelet based Image Compression

Reference(s)

- 1. Rafael C Gonzalez, Richard E Woods 3nd Edition, Digital Image processing, Pearson Education, 2018.
- 2. S. Jayaraman, S. Esakkirajan, T. Veerakumar, Digital Image Processing, Tata McGraw Hill education private limited, Second Edition, 2020.
- 3. William K Pratt, Digital Image Processing, John Willey, 2007.
- 4. MillmanSonka, Vaclav Hlavac, Roger Boyle, Broos/colic, Learning Image Processing analysis and Machine Vision, Thompson, Fourth Edition, 2015.
- 5. Chanda Dutta Majumdar, Digital Image Processing and Applications, Prentice Hall of India, Second Edition, 2011.
- 6. http://nptel.iitm.ac.in/courses/Webcourse-contents/ Digi_Img_Pro.

21SE62 COMPUTER VISION 3003

Course Objectives

- Understand the image formation and processing in the field of computer vision.
- Apply the feature extraction and segmentation techniques to extract the information from the images.
- Implement the methods used for image alignment and estimation on 2D and 3D point matching.
- Apply the object recognition and search options for the given data set.
- Develop a computer algorithm to process visual data from the real-time applications.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions

9 Hours

9 Hours

for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- Apply geometric transformations for restoring the digital images. 1.
- 2. Build the solutions for real world problems using feature extraction and segmentation techniques.
- 3. Demonstrate the algorithms for aligning images and estimating motion in video sequences.
- 4. Develop algorithms for object recognition and image searching.
- 5. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

UNIT I

IMAGE FORMATION AND PROCESSING

Computer Vision introduction - Geometric primitives and transformations - Photometric image formation -The digital camera - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization- Application Image Restoration and Morphing.

UNIT II

FEATURE DETECTION AND SEGMENTATION

Feature detectors - descriptors - matching and tracking - Edge and line detection- Application Edge editing and Enhancement and Rectangle detection - Segmentation- Active contours - Split and merge - Mean shift and mode finding Normalized cuts-Graph cuts and energy-based methods Application Medical Image Segmentation.

UNIT III

2D AND 3D POINT SET ALIGNMENT AND ESTIMATION

2D and 3D feature-based alignment -Pose estimation - Geometric intrinsic calibration - Triangulation - Twoframe structure from motion _ Factorization _ Bundle adjustment Constrained structure and motion-Spline based motion - Optical flow Estimation - Application Augmented reality.

UNIT IV

RECOGNITION

Objects Detection - Instance recognition- Category recognition - Context and scene understanding - Application Location identification and image Search.

UNIT V

ROBOT VISION

Optimal Design of Robot Vision Systems - 3D robot navigation in dynamic environments - recognizing Human Gait Types - Industrial Assembly and Quality Control – Biometric identification.

FURTHER READING

Histogram processing, noise models, Morphological Image Processing, Object recognition

Reference(s)

Richard Szeliski, Computer Vision Algorithms and Applications, Springer-Verlag London Limited ,2nd 1. Edition ,2021.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

- 2. Dr. Shruti Jain and Dr. Sudip Paul, Recent Trends in Image and Signal Processing in Computer Vision,1st Edition,2020.
- 3. Steve Holden, Computer Vision: Advanced Techniques and Applications, CLANRYE International, 1st Edition, 2019.
- 4. R.C. Gonzalez and R.E. Woods, Digital Image Processing, 4th edition Pearson , 2017. Ales Ude , Robot Vision ,Open Access Book , In-Tech , 2010
- 5. Ales Ude , Robot Vision ,Open Access Book , In-Tech , 2010
- 6. D. A. Forsyth, J. Ponce Computer Vision A Modern Approach, Pearson Education, Second Edition, 2012.

21SE63 BLOCKCHAIN 3003

Course Objectives

- To introduce students to the basic concepts and techniques of BlockChain
- Identify major research challenges and technical gaps existing between theory and practice in blockchain domain
- Understand emerging abstract models for Blockchain Technology
- Recognize the architecture and design of Decentralized Applications

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Understand the basic concepts of BlockChain Technology and Distributed Ledger Technology
- 2. Apply the Cryptographic techniques in BlockChain Technology
- 3. Apply the Consensus model in BlockChain Technology
- 4. Apply the decentralized applications and smart contract to enable a decentralized future
- 5. Apply the appropriate functionality of smart contract in Ethereum blockchain

UNIT I

BLOCKCHAIN BASICS

Introduction to BlockChain Technology, Bitcoin and Blockchain History, Basics of BlockChain, Types of BlockChain, BlockChain and Crypto currency, Distributed Ledger Technology (DLT), Bitcoin Mechanics and Optimizations, BlockChain Mining, Mining Bitcoin, Bitcoin Wallets

UNIT II

BLOCKCHAIN AND CRYPTOGRAPHY

Introduction to Cryptographic concepts, Overview of Hashing, Signature schemes, Encryption schemes and Elliptic Curve Cryptography, Public Key Cryptosystems, Private vs. Public BlockChain and use cases, Hash Puzzles.

UNIT III

CONSENSUS MECHANISMS

The consensus problem, Asynchronous Byzantine Agreement, AAP protocol and its analysis, Nakamoto Consensus on Permission-less, nameless, peer-to-peer network, Abstract Models for BLOCKCHAIN, GARAY model, RLA Model, Proof of Work (PoW), Proof of Stake (PoS), Hybrid models (PoW + PoS).

UNIT IV

SMART CONTRACT AND DECENTRALIZED APPLICATIONS (DAPPS)

Smart Contracts: Enabling a Decentralized Future, Game Theory and Network Attacks: How to Destroy Bitcoin, Crypto economics, Architecture of a DAPPS: the front-end client interface, backed by the blockchain: the basic design of a Dapp, Truffle development process and commands (init, develop, test and migrate).

UNIT V

ETHEREUM

Ethereum, Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity, Ethereum protocol, Ethereum blockchain, Create accounts, Unlock accounts, Mine, Transact, Transfer Ethers, and Check balances.

FURTHER READING

Zero Knowledge proofs and protocols in Blockchain, Succinct non interactive argument for Knowledge (SNARK), pairing on Elliptic curves, Zcash.

Reference(s)

- 1. Bitcoin and Cryptocurrency Technologies by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder
- 2. Mastering Bitcoin by Andreas Antonopoulos
- 3. Bhadoria, Robin Singh, and Vaibhav Agasti. "The paradigms of blockchain technology: myths, facts & future." International Journal of Information Systems and Social Change (IJISSC) 10.2 (2019): 1-14.
- 4. Carlozo, Lou. "What Is Blockchain? Here"s a Primer on the Potentially Transformative Digital Ledger Technology." Journal of Accountancy 224.1 (2017): 29.
- 5. Michael, J., A. L. A. N. Cohn, and Jared R. Butcher. "Blockchain technology." The Journal 1.7 (2018).
- 6. R.Pass et al. Fruitchain, a fair blockchain, PODC 2017

9 Hours

9 Hours

9 Hours

9 Hours

21SE64 DESIGN OF ENTERPRISE SOFTWARE SYSTEMS 3003

Course Objectives

- Familiarize students with technology and programming platform for developing enterprise software systems
- Enable students to design databases and carry out coding design for the development of enterprise software systems
- Enable students to maintain large scale enterprise software systems by analyzing existing coding and incorporating change requirements

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Develop software applications using enterprise software editions
- 2. Design role management system to control the resource allocation in enterprise software systems.
- 3. Design human resource management system for enterprise software systems.
- 4. Design systems to manage financial accounting, material and inventory management for enterprise systems.
- 5. Analyze production process for manufacturing and other different types of enterprises.

UNIT I

PROGRAMMING BASICS

Introduction to Java Enterprise System - Server side programming - Client Side Programming - JavaScripts Libraries - Web Application Life Cycle Events Framework - Web Application Security - Filters - Introduction to RESTful web services

UNIT II

ROLE MANAGEMENT SYSTEM

Defining Roles, Role Management, User Management, User Activity Tracking, Design and implementation

UNIT III

HUMAN RESOURCE MANAGEMENT

Employee Management, Leave Management, Time and Attendance Management, Payroll Management, HR Reporting, Design and Implementation

9 Hours

9 Hours

UNIT IV

MATERIAL MANAGEMENT AND ACCOUNTING

Introduction to financial accounting, Design of accounting systems, Stores management system design, inventory and stock management

UNIT V

PRODUCTION SYSTEM: CASE STUDY

Defining Production Process for Academics, Curriculum, Time Management, Attendance Management, Performance Management, Design and Implementation

FOR FURTHER READING

Cloud based enterprise systems

Reference(s)

- 1. Sergey V. Zykov, Alexander Gromoff, "Software Engineering for Enterprise System Agility: Emerging Research and Opportunities", IGI Global, 2018
- 2. Klaus-Dieter Gronwald , Integrated Business Information Systems: A Holistic View of the Linked Business Process Chain ERP-SCM-CRM-BI-Big Data, Springer, 2020
- 3. John Brock, Arun Gupta, GeertjanWielenga, "Java EE and HTML5 Enterprise Application Development", McGraw Hill Education, 2014.

21SE65 ENTERPRISE SYSTEMS SECURITY AND FORENSICS 3003

Course Objectives

- Design solutions secure enterprise eco systems components including network, web server, application server, database server and devices.
- Design and implement a Zero Trust security architecture for an enterprise to deliver significantly improved security and streamlined operations.

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

d. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Manage enterprise networking and enterprise firewall to protect enterprise resources.
- 2. Identify the client side and server side vulnerabilities of enterprise software and protect them from exploits.
- 3. Deploy enterprise application and database servers and secure them.
- 4. Infer role based access systems and protect enterprise data from unauthorized modifications.
- 5. Design and implement zero trust security systems

9 Hours

9 Hours

42

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021

UNIT I

ENTERPRISE NETWORK SECURITY

UNIT II

ENTERPRISE APPLICATION SECURITY

Enterprise Application Architecture, Common threats, Browser exploits, Client side security, server side security, sql attacks, script injection attacks, web application firewalls, Application Level Forensics

Enterprise Networking - Firewall Management, System Deployment Architecture, VLAN and Network Isolation, port blocking, safeguarding DNS, DNS attack tactics and case studies, Distributed Denial of

Service mitigation, Network Forensics, Open-source security tools for network forensic analysis

UNIT III

ENTERPRISE SERVER SECURITY

Server Deployment, Securing Server access, Securing Communication with Web Servers SSL configuration, web server vulnerabilities, Penetration Testing Forensics analysis of web servers, Securing Application Servers, Securing Database Servers, Database Forensics

UNIT IV

ENTERPRISE DATA SECURITY

Privacy and Protection, Data Security Policies, user rights management, Data Hashing, Role based access, Detecting unauthorized data modifications, Data access forensics

UNIT V

ZERO TRUST SECURITY

Zero Trust security principles, operational benefits of Zero Trust, Zero Trust security architectures, Impacts and benefits

FOR FURTHER READING

eMAIL spam -Malware - Password security - Anti-Social, Social Networking

Reference(s)

- 1. Suku Nair, Marco Marchetti, John Hopkinson, Seth Fogie, "Enterprise Security: Compliance v. Competence", 2021
- 2. Jason Garbis and Jerry W. Chapman, "Zero Trust Security: An Enterprise Guide", APress, 2021
- 3. Manish Gupta and Raj Sharman, Information Technology Risk Management and Compliance in Modern Organizations, 2017
- 4. Adrian Pruteanu and Zeal Vora, Enterprise Cloud Security and Governance Efficiently set data protection and privacy principles, 2017.

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

21SE66 CLOUD INFRASTRUCTURE MANAGEMENT SYSTEMS 3003

Course Objectives

- Familiarize students with the practical aspects of IaaS (Infrastructure as a Service) cloud computing model
- Familiarize students with the installation and configuration procedure of compute, storage and networking components of OpenStack platform for establishing enterprise private cloud

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

f. Create Software Products that emphasize the growth of a nation to fulfil the societal needs by incorporating software engineering models.

Course Outcomes (COs)

- 1. Design the basic environment required for openstack implementation and configure keystone service for authentication and glance service for managing cloud vm images authentication and glanceservice for managing cloud vm images
- 2. Install and configure compute and neutron service for creating Infrastructure as the Service(IaaS)cloud platform
- 3. Install and Configure dashboard service to manage projects, roles and users.
- 4. Install and Configure Storage Services.
- 5. Install and Configure Orchestration service, Telemetry service, Database Services, ContainerServices

UNIT I

BASIC ENVIRONMENT

Introduction to Cloud Computing - Openstack Architecture - Basic Requirements - Configuring Identity service - Configuring keystone and its dataset - Image service - Managing Glance

UNIT II

COMPUTE AND NETWORK MANAGEMENT

Compute service - Installing Nova with its API - Managing security groups - Networking service - Managing neutron services - VLAN Manager networking

UNIT III

DASHBOARD MANAGEMENT

Dashboard Service - Horizon Installation - GUI Management and Maintenance - creating network - flavor creation - Resource usage monitoring

9 Hours

9 Hours

UNIT IV

STORAGE MANAGEMENT

Block Storage vs Object Storage - Installation and configuration of cinder - attach volume to VM instances - Configure booting from volume - Installation and configuration of swift - java api integration

UNIT V

VM MANAGEMENT

Orchestration service - Telemetry service- Launch VM instances

FOR FURTHER READING

Green Cloud Computing- Edge Computing- Cloud Cryptography. Load Balancing - Cloud Analytics - OPEN STACK

Reference(s)

- 1. Ben Silverman and Michael Solberg, OpenStack for Architects: Design production-ready private cloud infrastructure, 2nd Edition, PackT, 2018
- 2. Kevin Jackson, Openstack Cloud Computing Cookbook Fourth Edition, PackT, 2018
- 3. Uchit Vyas, Applied OpenStack Design Patterns: Design solutions for production-ready infrastructure with OpenStack components, APress, 2017

21SE67 NATURAL LANGUAGE PROCESSING 3003

Course Objectives

- Understand the representation and processing of Morphology and Part-of Speech Taggers
- Express different aspects of natural language syntax and the various methods used for processing syntax
- To know about various applications of natural language processing

Programme Outcomes (POs)

a. An ability to independently carry out research investigation and development work to solve practical problems related to software Engineering.

b. An ability to write and present a substantial technical report/document based on the standards.

c. Students should be 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. Use research-based tools, methods and algorithms to carry out design of experiments, data analysis and synthesis of information for valid conclusions.

e. Apply ethical principles to commit the responsibilities of software engineering practices to provide solutions for the real-world problem.

Course Outcomes (COs)

- 1. Identify the different linguistic components of given sentences.
- 2. Design a morphological analyzer for a language using finite state automata concepts
- 3. Implement a parser by providing suitable grammar and words
- 4. Recognize the semantic role of the sentence and implement the semantic parsing
- 5. Apply the machine translation and statistical translation to extract the information from the sentence

9 Hours

9 Hours

45

Syllabi: M.E. Software Engineering| Minimum Credits to be earned: 68| Regulations 2021

UNIT I

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

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

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

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

APPLICATIONS

Named entity recognition and relation extraction- Information Extraction (IE) using sequence labeling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment- phrase-based translation - Question Answering- VXML Applications

FOR FURTHER READING

Word sense disambiguation-discourse analysis and lexical resources- porter stemmer, Lemmatizer, Penn Treebank, brill tagger, wordnet, PropBank, FrameNet, brown corpus, British National Corpus (BNC)

Reference(s)

- 1. Daniel Jurafsky and James H. Martin "Speech and Language Processing", Second Edition, Prentice Hall, 2020
- 2. Christopher D. Manning and Hinrich Schuetze, "Foundations of Statistical Natural Language Processing", MIT Press, 2014.
- 3. Roland R. Hausser, "Foundations of Computational Linguistics Human- Computer Communication in Natural Language", Springer, 2014.

9 Hours

10 Hours

10 Hours

8 Hours

8 Hours

AUDIT COURSES

21XE01 ENGLISH FOR RESEARCH PAPER WRITING 2000

Course Objectives

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

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

e. Comprehend and write effective technical reports, design documentation, and make effectivepresentations.

Course Outcomes (COs)

- 1. Illustrate the research ideas and writing journal papers
- 2. Creating research paper writing

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

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

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission. **Total: 30 Hours**

Reference(s)

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)

5 Hours

5 Hours

5 Hours

5 Hours

5 Hours

- 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. Highmans book.
- 4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

21XE02 COST MANAGEMENT OF ENGINEERING PROJECTS

Course Objectives

- To understand the cost concepts and different stages of project execution and its activities.
- To understand cost behavior, management and its quantitative techniques.

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

e. Comprehend and write effective technical reports, design documentation, and make effective presentations.

Course Outcomes (COs)

- 1. Apply the cost concepts in decision making.
- 2. Analyze the various stages of project execution and its activities.
- 3. Analyze the cost behavior and various types of costing.
- 4. Analyze the cost management and budget related decisions.
- 5. Analyze the quantitative techniques for cost management.

UNIT I

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

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 nontechnical 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.

2000

UNIT III

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.

UNIT IV

TOTAL QUALITY MANAGEMENT AND THEORY OF CONSTRAINTS

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

QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT

Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Total: 30 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
- 4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
- 5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

21XE03 STRESS MANAGEMENT 2000

Course Objectives

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

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

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

Definitions of Eight parts of yog. (Ashtanga)

UNIT II

Yam and Niyam. Dos and Donts in life.i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii)Shaucha, santosh, tapa, swadhyay, ishwarpranidhan.

6 Hours

6 Hours

6 Hours

10 Hours

UNIT III

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

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.

21XE04 DISASTER MANAGEMENT 2000

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 inspecific 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

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

Course Outcomes (COs)

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

UNI I

INTRODUCTION

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

UNIT II

REPERCUSSIONS OF DISASTERS AND HAZARDS

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

10 Hours

Total: 30 Hours

5 Hours

UNIT III

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

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

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

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.

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]

21XE05 VALUE EDUCATION

Course Objectives

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

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

e. Comprehend and write effective technical reports, design documentation, and make effectivepresentations.

5 Hours

5 Hours

5 Hours

5 Hours

2000

Total: 30 Hours

Course Outcomes (COs)

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

UNIT I

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

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

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 selfdestructive habits-Association and Cooperation-Doing best for saving nature.

UNIT IV

Reference(s)

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.

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

21XE06 PEDAGOGY STUDIES

Course Objectives

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

Programme Outcomes (POs)

d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.

51

7 Hours

Total: 30 Hours

2000

7 Hours

8 Hours

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021 e. Comprehend and write effective technical reports, design documentation, and make effectivepresentations.

Course Outcomes (COs)

- 1. What pedagogical practices are being used by teachers in formal and informal classrooms indeveloping 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 guidancematerials best support effective pedagogy? verall personality

UNIT I

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

THEMATIC OVERVIEW

Pedagogical practices are being used by teachers in formal and informal classrooms in eveloping countries, Curriculum, Teacher education.

UNIT III

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

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.

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

7 Hours

7 Hours

Total: 30 Hours

8 Hours

Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021 research project (MUSTER) country report 1. London: DFID

- 4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning ofbasic 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.

21XE07 BUSINESS ANALYTICS

Course Objectives

- Illustrate 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 businessproblems 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)

b. Use research-based knowledge to interpret/investigate the problems, provide solutions and worktowards the development of socially relevant products.d. Apply ethical principles with commitment to professional ethics and responsibilities as per norms of the communication systems practice.e. Comprehend and write effective technical reports, design documentation, and

make effectivepresentations.

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

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,

6 Hours

2000

Review of probability distribution and data modelling, sampling Syllabi: M.E. Software Engineering Minimum Credits to be earned: 68 Regulations 2021 and estimation methods overview

UNIT II

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

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, predictive 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

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

DECISION ANALYSIS

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

Total: 30 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

6 Hours

6 Hours

6 Hours