R-21

ACADEMIC REGULATIONS,

COURSE STRUCTURE & SYLLABI

FOR

M. Tech. (SOFTWARE ENGINEERING)

Two Year PG Day-Time Program
(with effect from 2021 – 22)

JNTUH SCHOOL OF INFORMATION TECHNOLOGY
(AUTONOMOUS)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
Kukatpally, Hyderabad – 500 085 TELANGANA.

SCHOOL OF INFORMATION TECHNOLOGY
(AUTONOMOUS)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
Kukatpally, Hyderabad – 500 085, Telangana (India)

ACADEMIC REGULATIONS OF
M.TECH. (REGULAR/FULL TIME) PROGRAMMES, 2021-2022(R-21)
CHOICE BASED CREDIT SYSTEM (CBCS)
(WITH EFFECT FROM THE ACADEMIC YEAR 2021 – 2022)

The Master of Technology (M.Tech.) Post Graduate Degree of the Jawaharlal Nehru Technological University Hyderabad (JNTUH) shall be conferred on candidates who are admitted to the program and who fulfill all the requirements for the award of the Degree.

JNTUH offers 2 Years (4 Semesters) Master of Technology (M.Tech.) Post Graduate Degree program, under Choice Based Credit System (CBCS) at its constituent Autonomous College – ***JNTUH, SCHOOL OF INFORMATION TECHNOLOGY (JNTUH SIT),*** Hyderabad in the following specializations

S.No.	Specialization
1	Computer Science(CS)
2	Software Engineering(SE)
3	Computer Networks & Information Security(CNIS)
4.	Data Sciences(DS)

1. ELIGIBILITY FOR ADMISSIONS

1.1 Admission to the above shall be made subject to eligibility, qualification and specialization as prescribed by the University for each Program, from time to time.

1.2 Admissions shall be made on the basis of merit rank obtained by the qualifying candidate on the basis of Valid GATE score or at an Entrance Test (TSPGECET) conducted by TELANGANA State Government, subject to reservations prescribed by the University time to time through Directorate of admissions JNTUH.

2. AWARD OF M. Tech. DEGREE

2.1 A candidate shall be declared eligible for the award of the M. Tech. Degree, if candidate pursues a course of study in not less than two and not more than four academic years.

2.2 A candidate who fails to fulfill all the academic requirements for the award of the degree within four academic years from the year of his/her admission shall forfeit his/her seat in M. Tech. course.

3. M.TECH. PROGRAMS STRUCTURE

3.1 The M.Tech. Programs of SIT-JNTUH are of Semester Pattern, with 4 Semesters constituting 2 Academic Years, each Academic Year having TWO Semesters

(First/Odd and Second/Even Semesters). Each Semester shall be of 22 Weeks duration (inclusive of Examinations).

3.2 UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below.

3.3 **Semester Scheme:** Each PG program is of 2 Academic Years (4 Semesters), with the year being divided into two Semesters of 22 weeks (≥ 90 working days) each, each Semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, and Curriculum/ Course Structure as suggested by AICTE are followed.

3.4 **Credit Courses:** Subjects/ Courses are to be registered by a candidate in a Semester to earn Credits. Credits shall be assigned to each Subject/ Course in a L: P: C (Lecture Periods: Practical Periods: Credits) Structure, based on the following general pattern.

i. One Credit - for One hour/ Week/ for Theory/ Lecture (L) Courses
ii. One Credit - for Two hours/ Week/ for Laboratory/ Practical (P) Courses
iii. Other student activities like study tour, guest lecture, conference/workshop participations, technical paper presentations and mandatory courses (Audit Courses) will not carry any credits.

4. COURSE WORK

4.1 A candidate after securing admission shall pursue the M.Tech. in a minimum period of 2 Academic Years, and a maximum period of 4 Academic Years (starting from the Date of Commencement of I Year).

4.2 Each candidate shall register for and secure the specified number of Credits required for the completion and award of the M.Tech. Degree in respective specialization.

4.3 Each of I Year I Semester and II Semester offers 19 Credits (I Year = 2 X 19 =38C) and II Year I Semester and II Semester offer 16 Credits (II Year = 2 X 16 = 32C) each, totaling to 70 Credits (70C) for the entire M.Tech. Program.

4.4 **The candidate shall register for all 70 credits and secure all the 70 credits.**

5. COURSE REGISTRATION

5.1 A 'Course Coordinator or Faculty Advisor' shall be assigned to each candidate, who will advise him/her about the M.Tech. Program, its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his/her competence, progress, pre-requisites and interest.

5.2 Academic Section of the College invites 'Registration Forms' from candidate's apriori (before the beginning of the Semester). The Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

5.3 A candidate can register, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Course Coordinator, which should be submitted to the College Academic Section.

5.4 A candidate may be permitted to register for Subjects/ Course of his/her CHOICE with a typical total of 19 Credits per Semester (I & II Semesters): **Minimum being 16 Credits and Maximum being 22 Credits**, based on his PROGRESS and SGPA/ CGPA, and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses, in the Department Course Structure and Syllabus contents. A candidate must register all the CORE subjects/courses.

5.5 The candidate has to register for the audit course(s) and must pass the audit course(s) for successful completion of the degree. However the credits earned in the audit courses are not included in the computation of the SGPA/CGPA

5.6 Choice for 'additional Subjects/ Courses' to reach the Maximum Permissible Limit of 22 Credits (above the typical 19 Credit norm) must be clearly indicated, which needs the specific approval and signature of the Course Coordinator.

5.7 If the Candidate submits ambiguous choices or multiple options or erroneous entries during Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration.

5.8 Subject/ Course Options exercised are final and CAN NOT be changed. However, if the Subject/ Course that has already been listed for Registration (by the Course Coordinator) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Candidate shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Course Coordinator, with due notification and time framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5.9 Dropping of Subjects/ Courses may be permitted, ONLY AFTER obtaining prior approval from the Course Coordinator/Faculty Advisor (subject to retaining a minimum of 16 C), 'within 15 Days of Time' from the beginning of the current Semester.

5.10 Candidates may register for NPTEL/SWAYAM as per the university rules.

6. SUBJECTS/ COURSES TO BE OFFERED

6.1 A Subject/ Course may be offered to the Candidates, ONLY IF a Minimum of $1/3^{rd}$ of the Section Strength opt for the same.

6.2 More than ONE TEACHER may offer the SAME SUBJECT (Lab/ Practicals may be included with the corresponding Theory Subject in the same Semester) in any Semester. However, selection choice for candidates will be based on - 'FIRST COME FIRST SERVE Basis and CGPA Criterion'.

6.3 If more entries for Registration of a Subject come into picture, then the concerned Course Coordinator shall take necessary action, whether to offer such a Subject/ Course for TWO (or multiple) SECTIONS or NOT .

6.4 In case of options coming from Candidates of other Departments/ Branches/ Disciplines (not considering OPEN ELECTIVES), PRIORITY shall be given to the candidate of the 'Parent Department' first.

7. ATTENDANCE

7.1 The candidate shall put in a minimum of 75% attendance per semester independently for each of the course/subject registered.

7.2 Condonation of shortage of attendance up to 10% in each course/subject registered(65% and above and less than 75%) may be given by the College/school Academic Committee.

7.3 Shortage of Attendance below 65% shall not be condoned. Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence and by paying stipulated fee.

7.4 Candidates whose shortage of attendance is not condoned in any course/subject registered are not eligible to write their end semester examination of that course/subject, they get **DETAINED** in that course/subject. The candidate will have to repeat that course/subject as and when offered; in case if there are any Professional Electives and/or Open Electives, the same may also be re-registered if offered, however, if those electives are not offered in later semesters, then alternate electives may be chosen from the SAME set of ELECTIVE subjects offered under that category. In such a case candidate has to pay tuition fee for that course/subject.

7.5 A Candidate shall put in a minimum required attendance in at least three (3) theory subjects in each semester for promoting to next Semester. In order to qualify for the award of the M.Tech Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

8. EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Internal Evaluation and End Semester Examination.

8.1 Evaluation of a candidate in a course/subject involves both external and internal components (except audit course). External evaluation will be in the form of Semester End Examination (SEE) in a course/subject for which 60 marks are allocated. The remaining 40 marks are allocated to Continuous Internal Evaluation(CIE).

8.2 **For theory subjects**,

8.2.1 The continuous internal evaluation has two Mid Term-Examinations (each of 40 marks). They are conducted as one in the middle of the Semester and the other immediately after the completion of instruction. Each midterm examination shall be conducted for a total duration of 120 minutes. The best one will be considered.

8.2.2 The End semester Examination will be conducted in each subject for 60 marks. The question paper consists of 8 questions. Each of these questions may contain sub-questions. Each question carries 12 marks. The candidate will be required to answer 5 questions.

The questions are to be prepared to cover the entire range of prescribed syllabi of the subjects and units.

8.3 For practical subjects,

8.3.1 60 marks shall be awarded based on the performance in the End Semester Examinations

8.3.2 40 marks shall be awarded based on the day-to-day performance in the lab and the performance in internal lab examination.

8.4 For audit subjects,

8.4.1 The evaluation is based on INTERNAL EVALUATION only. The evaluation has two Mid Term-Examinations (each of 40 marks). They are conducted as one in the middle of the Semester and the other immediately after the completion of instruction.

8.4.2 Each midterm examinations shall be conducted for a total duration of 120 minutes. **The best one will be considered.**

8.5 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the Semester End Examination and a minimum aggregate of 50% of the total marks in the Semester End Examination and Internal Evaluation taken together. A candidate has to secure 50% of the marks allotted in the internal evaluation for passing the AUDIT Course.

8.6 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 8.5) he has to reappear for the Semester End Examination in that subject.

8.7 A candidate can re-register for the subjects, if the internal mark secured by a candidate is less than 50% and failed in that subject for maximum of two subjects and should register within four weeks of commencement of the class work. In such a case, the candidate must re-register for the subjects and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the Semester End Examination in those subjects. In the event of the candidate taking another chance, his Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stands cancelled.

9. Evaluation of Project / Dissertation Work

Every candidate shall be required to submit the thesis or dissertation after taking up a topic approved by the School/College.

9.1 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects (theory and practical subjects).A candidate has to choose the topic thesis in the first **2** weeks of the II Year I Semester in consultation with the Internal/External guides. After 2 weeks candidate has to submit an abstract of work to be carried out to the Project Review Committee (PRC), which in turn allows the candidate to register for thesis work if it is satisfied with the abstract submitted by the candidate.

9.2 A Project Review Committee (PRC) shall be constituted with Course Coordinator, Guide and a faculty member from the school.

9.3 Only after obtaining the approval of Project Review Committee (PRC), the candidate can initiate the Project work.

9.4 If a candidate wishes to change his supervisor or topic of the project he can do so with the approval of a committee appointed by the Director, SIT. However, the committee shall examine whether the change of topic/supervisor leads to a major change of his initial plans of project proposal. If so, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

9.5 The total duration of the project is for 44 weeks which is spread across 22weeks in II Year I semester and 22 Weeks in II year II semester. The candidate can submit the final project only after 40 weeks from the date of registration after the approval of PRC.

9.6 Internal Evaluation of the project shall be on the basis of the seminars (Project reviews) conducted during the II Year I semester and II semesters by the Project Review Committee (PRC). In II Year I semester two seminars are conducted and in II Year II semester two seminars are conducted.

9.7 At the end of the II Year I semester, a candidate shall submit status report in a spiral bound copy form. Internal marks are for 40 marks which will be awarded by PRC. External marks are for 60 marks which will be awarded by an external examiner appointed by the Director, SIT. Evaluation of project by PRC (for 40 marks) and by the external examiner (for 60 marks) will be done simultaneously. **One publication is mandatory in Journal or conference for submission of the thesis.**

9.8 At the end of the II Year II semester, after approval from the PRC, the soft copy of the thesis should be submitted for ANTI-PLAGIARISM for the quality check and the plagiarism report should be included in the final thesis. If the copied information is less than 24%, then only thesis will be accepted for submission. A candidate shall submit the thesis/dissertation in a hard bound copy form. He will attend for the viva-voce. An external examiner appointed by the Director will evaluate the project for 100 marks. There will be no internal marks for phase II of the project.

9.9 The candidate has to submit two hard copies and one soft copy of Thesis/Dissertation, certified in the prescribed format by the supervisor to the school.

9.10 The Thesis/Dissertation will be adjudicated by one external examiner selected by the competent authority.

9.11 In case the candidate fails in viva-voce examination, based on the recommendation of the board the candidate has to retake the viva-voce examination after three months. If he fails in this viva-voce examination also, he will not be eligible for the award of the degree unless the candidate is asked to revise and resubmit.

10. Examinations and Assessment - The Grading System

10.1 Grades will be awarded to indicate the performance of each candidate in each Theory Subject, or Lab/Practicals, or Seminar, or Project, etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 8 above, and a corresponding Letter Grade shall be given.

10.2 As a measure of the candidate's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

Marks Obtained	Grade	Description of Grade	Grade Points (GP)
>=90	O	Outstanding	10
>=80 and <90	A+	Excellent	9
>=70 and <80	A	Very Good	8
>=60 and <70	B+	Good	7
>=50 and <60	B	Average	6
<50	F	Fail	0
Not Appeared the Exam(s)	AB	Absent	0

10.3 A candidate obtaining F Grade in any Subject shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subjects will remain the same as those he obtained earlier.

10.4 A candidate not appeared for examination then 'AB' Grade will be allocated in any Subject shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered.

10.5 A Letter Grade does not imply any specific Marks percentage and it will be the range of marks percentage.

10.6 In general, a candidate shall not be permitted to repeat any Subject/ Course (s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'.

10.7 A candidate earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course. The corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a Subject

10.8 The Candidate passes the Subject/ Course only when he **gets GP ≥ 6 (B Grade or above).**

10.9 The Grade Point Average (GPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects registered in a Semester or for the Exam appeared (like supplementary), by the Total Number of Credits registered during that Semester or for the Exam appeared (like supplementary). GPA is rounded off to FOUR Decimal Places. GPA is thus computed as

$$GPA = \frac{\sum_{1}^{n} C_i \times GP_i}{\sum_{1}^{n} C_i}$$

Where n is the number of subjects Registered in that semester / exam.

C_i is Credits for the subjects.

GP_i is the grade point obtained for the subject

where 'i' is the Subject indicator index (takes into account all Subjects in a Semester or for the Exam appeared), 'N' is the no. of Subjects 'REGISTERED' for the Semester or for the Exam appeared, C_i is the no. of Credits allotted to the i^{th} Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Subject.

10.10 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a candidate over all Subjects in all considered for registration. The CGPA is the ratio of the Total Credit Points secured by a candidate in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to FOUR Decimal Places. CGPA is thus computed as per the formula

$$CGPA = \frac{\sum_{1}^{m} GPA_j \times TC_j}{\sum_{j=1}^{m} TC_j}$$

where m is the number of subjects registered in the course.

TC_j the total number of credits for a j^{th} subject.

GPA_j is the Grade point of the j^{th} subject.

10.11 For Calculations listed in Item 10.6 – 10.10, performance in failed Subjects/ Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/ Courses will also be included in the multiplications and summations.

10.12 For Final % of Marks equivalent to the computed CGPA, the following formula may be used. % of

Marks = (CGPA – 0.5) x 10

11. AWARD OF DEGREE AND CLASS

11.1 A Candidate who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG (PGP), and secures the required number

of **70** Credits (with CGPA ≥ 6.0), shall be declared to have 'QUALIFIED' for the award of the M.Tech. Degree in the chosen Branch of Engineering and Technology with specialization as he admitted.

11.2 Award of Class: After a candidate has satisfied the requirements prescribed for the completion of the Degree and is eligible for the award of M. Tech. Degree, he shall be placed in one of the following three classes based on the CGPA:

Class Awarded	CGPA
First Class with Distinction	≥ 7.75
First Class	6.75 ≤ CGPA < 7.75
Second Class	6.00 ≤ CGPA < 6.75

11.3 A candidate with final CGPA (at the end of the PGP) < 6.00 will not be eligible for the award of Degree.

12. WITHHOLDING OF RESULTS

12.1 If the candidate has not paid the dues, if any, to the University or if any case of indiscipline is pending against him, the result of the candidate will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

13. TRANSITORY REGULATIONS

13.1 If any candidate is detained due to shortage of attendance in one or more subjects, they are eligible for admission to maximum of two earlier or equivalent subjects at a time as and when offered.

13.2 In case any candidate makes a re-registration then the academic regulations which were applicable for the year of his joining year will be applicable.

14. GENERAL

14.1 **Credit**: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

14.2 **Credit Point:** It is the product of grade point and number of credits for a course.

14.3 Wherever the words "he", "him", "his", occur in the regulations, they include "she","her".

14.4 The academic regulation should be read as a whole for the purpose of any interpretation.

14.5 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

14.6 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the candidates with effect from the dates notified by the University.

15. MALPRACTICES RULES

15.1 Disciplinary Action For / Improper Conduct In Examinations

S.No.	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that

		semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in- charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of candidates of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical Examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If candidate of the college, who is not a candidate for the particular	Candidate of the colleges expulsion from the examination hall and cancellation of the

	examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

15.2 Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions:

(if the squad reports that the college is also involved in encouraging malpractices)

(i) A show cause notice shall be issued to the college.
(ii) Impose a suitable fine on the college.
(iii) Shifting the examination centre from the college to another college for a specific period of not less than one year

JNTUH SCHOOL OF INFORMATION TECHNOLOGY
(Autonomous)
MASTER OF TECHNOLOGY- SOFTWARE ENGINEERING

I YEAR I SEMESTER

S. No.	Subject Code	Subject	L	T	P	Max Marks(100)		Credits
						Int	Ext	
1.	SE1C10	**Core-1:** Advanced Data Structures and Algorithms	3		-	40	60	3
2.	SE1C20	**Core-2:** Software Engineering	3		-	40	60	3
3.	SE1C30	**Core-3:** Advanced Computer Networks	3		-	40	60	3
4.	SE1E10	**Elective-1:**	3		-	40	60	3
	SE1E11	Object Oriented Modeling						
	SE1E12	Internet Technologies and Services						
	SE1E13	Internet of Things						
	SE1E14	Data Warehousing & Data Mining						
	SE1E15	Advanced Programming						
5.	SE1E20	**Elective-2:**	3		-	40	60	3
	SE1E21	Information Retrieval Systems						
	SE1E22	Artificial Intelligence						
	SE1E23	Cloud Computing						
	SE1E24	Advanced Databases						
	SE1E25	Operating Systems Security						
6.	SE1L10	**Lab-1:** Advanced Data Structures and Algorithms Through Java Lab	-		4	40	60	2
7.	SE1L20	**Lab-2(Based On Elective-1):**	-		4	40	60	2
	SE1L21	Object Oriented Modeling Lab						
	SE1L22	Internet Technologies and Services Lab						
	SE1L23	Internet of Things Lab						
	SE1L24	Data Warehousing & Data Mining Lab						
	SE1L25	Advanced Programming Lab						
8.	SE1A10	**Audit-1:**	2	-	-	100	-	0
	SE1A11	Foundations of Computer Science						
	SE1A12	Professional Communication Skills						
	SE1A13	Personality Development through Life Enlightenment Skills						
	SE1A14	Value Education						
	SE1A15	Constitution of India						
		Total	**17**	**-**	**8**	**-**	**-**	**19**

JNTUH SCHOOL OF INFORMATION TECHNOLOGY
(Autonomous)
MASTER OF TECHNOLOGY- SOFTWARE ENGINEERING
I YEAR II SEMESTER

S. No.	Subject Code	Subject	L	T	P	Max Marks(100)		Credits
						Int	Ext	
1.	SE2C10	**Core-4:**Software Architecture and Design Patterns	3		-	40	60	3
2.	SE2C20	**Core-5:** Software Quality Assurance and Testing	3		-	40	60	3
3.	SE2C30	**Core-6:** Software Requirements and Estimation	3		-	40	60	3
4.	SE2E30	**Elective—3:**	3		-	40	60	3
	SE2E31	Cryptography and Network Security						
	SE2E32	Computer Forensics						
	SE2E33	Mobile Application Development						
	SE2E34	Network Programming						
	SE2E35	Data Science						
	SE2E36	Advanced Algorithms						
5.	SE2E40	**Elective-4:**	3		-	40	60	3
	SE2E41	Machine Learning						
	SE2E42	Human Computer Interaction						
	SE2E43	Software Security Engineering						
	SE2E44	Natural Language Processing						
	SE2E45	Software Agents						
	SE2E46	Adhoc Networks						
6.	SE2L30	**Lab-3:**Software Engineering and Design Patterns Lab	-		4	40	60	2
7.	SE2L40	**Lab-4(Based On Elective-3):**	-		4	40	60	2
	SE2L41	Cryptography and Network Security Lab						
	SE2L42	Computer Forensics Lab						
	SE2L43	Mobile Application Development Lab						
	SE2L44	Network Programming Lab						
	SE2L45	Data Science Lab						
	SE2L46	Advanced Algorithms Lab						
8..	SE2A10	**Audit-2:**	2	-	-	100	-	0
	SE2A11	English for Research Paper Writing						
	SE2A12	Disaster Management						
	SE2A13	Soft Skills						
	SE2A14	Stress Management by Yoga						
	SE2A15	Sanskrit for Technical Knowledge						
	SE2A16	Research Methodology						
		Total	**17**	**-**	**8**			**19**

JNTUH SCHOOL OF INFORMATION TECHNOLOGY
(Autonomous)
MASTER OF TECHNOLOGY- SOFTWARE ENGINEERING

II YEAR I SEMESTER

S No.	Subject Code	Subject	L	T	P	Max Marks(100)		Credits
						Int	Ext	
1.	SE3E50	**Elective-5:**	3	-	-	40	60	3
	SE3E51	Software Process and Project Management						
	SE3E52	Semantic web and Social Networks						
	SE3E53	Big Data						
	SE3E54	Software Reliability						
	SE3E55	Mobile Computing						
	SE3E56	Block chain Technology						
2.	SE3O10	**Open Elective-1:**	3	-	-	40	60	3
	SE3O11	Image Processing and Pattern Recognition						
	SE3O12	Soft Computing						
	SE3O13	Biometrics						
	SE3O14	Computer Vision						
	SE3O15	Cyber Security						
	SE3O16	Network Design						
3.	SE3P10	**Project Work:** Project Phase-1	-	-	20	40	60	10
		TOTAL	**6**	**-**	**20**			**16**

II YEAR II SEMESTER

S. No	Subject Code	SUBJECT	L	T	P	Max Marks(100)		Credits
						Int.	Ext.	
1	SE4P10	**Project Work:** Project Phase-2	-	-	32	-	100	**16**
		TOTAL	**-**	**-**	**32**			**16**

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1C10

ADVANCED DATA STRUCTURES AND ALGORITHMS
(CORE – 1)

Objectives:

- The fundamental design, analysis, and implementation of basic data structures.
- Basic concepts in the specification and analysis of programs.
- Principles for good program design, especially the uses of data abstraction.
- Significance of algorithms in the computer field
- Various aspects of algorithm development
- Qualities of a good solution

UNIT I

Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big Oh, Omega and Theta notations, Complexity Analysis Examples.
Data structures-Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, Vector representation, singly linked lists -insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two dimensional arrays, Sparse matrices and their representation.

UNIT II

Stack and Queue ADTs, array and linked list representations, infix to postfix conversion using stack, implementation of recursion, Circular queue-insertion and deletion, Dequeue ADT, array and linked list representations, Priority queue ADT, implementation using Heaps, Insertion into a Max Heap, Deletion from a Max Heap, java.util package-ArrayList, Linked List, Vector classes, Stacks and Queues in java.util, Iterators in java.util.

UNIT III

Searching–Linear and binary search methods, Hashing-Hash functions, Collision Resolution methods-Open Addressing, Chaining, Hashing in java.util-HashMap, HashSet, Hashtable.
Sorting –Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort, comparison of sorting methods.

UNIT IV

Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non recursive traversals, Java code for traversals, Threaded binary trees.Graphs- Graphs terminology, Graph ADT, representations, graph traversals/search methods-dfs and bfs, Java code for graph traversals, Applications of Graphs-Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem.

UNIT V

Search trees- Binary search tree-Binary search tree ADT, insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees – Definition and examples only, B-Trees-definition, insertion and searching operations, Trees in java.util- TreeSet, Tree Map Classes, Tries(examples only),Comparison of Search trees.Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.

TEXT BOOKS:

1. Data structures, Algorithms and Applications in Java, S.Sahni, Universities Press.
2. Data structures and Algorithms in Java, Adam Drozdek, 3rd edition, Cengage Learning.
3. Data structures and Algorithm Analysis in Java, M.A.Weiss, 2nd edition, Addison-Wesley (Pearson Education).

REFERENCES:

1. Java for Programmers, Deitel and Deitel, Pearson education.
2. Data structures and Algorithms in Java, R.Lafore, Pearson education.
3. Java: The Complete Reference, 8th editon, Herbert Schildt, TMH.
4. Data structures and Algorithms in Java, M.T.Goodrich, R.Tomassia, 3rd edition, Wiley.
5. Data structures and the Java Collection Frame work,W.J.Collins, Mc Graw Hill.
6. Classic Data structures in Java, T.Budd, Addison-Wesley (Pearson Education).
7. Data structures with Java, Ford and Topp, Pearson Education.
8. Data structures using Java, D.S.Malik and P.S.Nair, Cengage learning.
9. Data structures with Java, J.R.Hubbard and A.Huray, PHI Pvt. Ltd.
10. Data structures and Software Development in an Object-Oriented Domain, J.P.Tremblay and G.A.Cheston, Java edition, Pearson Education.
11. A Practical Guide to Data Structures and Algorithms using Java, S.Goldman & K.Goldman, Chapman & Hall/CRC, Taylor & Francis Group.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1C20

SOFTWARE ENGINEERING
(CORE – 2)

Objectives:

Your studies will enable you to develop:

- a broad and critical understanding of all the processes for engineering high quality software and the principles, concepts and techniques associated with software development
- an ability to analyze and evaluate problems and draw on the theoretical and technical knowledge to develop solutions and systems
- a range of skills focused on the analysis of requirements, design and implementation of reliable and maintainable software, with strong emphasis on engineering principles applied over the whole development lifecycle
- an awareness of current research in software development, the analytical skills and research techniques for their critical and independent evaluation and their application to new problems.

UNIT I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, legacy software, Software myths.**A Generic view of process:** Software engineering - A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.**Process models:** The waterfall model, Incremental process models, Evolutionary process models, specialized process models, The Unified process.

UNIT II

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.System models: Context Models, Behavioral models, Data models, Object models, structured methods.

UNIT III

Design Engineering: Design process and Design quality, Design concepts, the design model, pattern based software design.**Creating an architectural design:** software architecture, Data design, Architectural styles and patterns, Architectural Design, assessing alternative architectural designs, mapping data flow into a software architecture.**Modeling component-level design:** Designing class-based components, conducting component-level design, Object constraint language, designing conventional components.Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

UNIT IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.**Product metrics:** Software Quality, Frame work for Product metrics, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance. **Metrics for Process and Products**: Software Measurement, Metrics for software quality.

UNIT V

Risk management: Reactive vs Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.**Quality Management**: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.**Configuration Management:** Configuration Management planning, Change management, Version and release management, System building, CASE tools for configuration management.

TEXT BOOKS:

1. Software Engineering: A practitioner's Approach, Roger S Pressman, sixth edition. McGraw Hill International Edition, 2005
2. Software Engineering, Ian Sommerville, seventh edition, Pearson education, 2004.

REFERENCE BOOKS:

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
2. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
3. Fundamentals of Software Engineering, Rajib Mall,PHI, 2005
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition, 2006.
7. Software Engineering Foundations, Yingxu Wang, Auerbach Publications, 2008.
8. Software Engineering 3: Domains, Requirements and Software Design, D.Bjorner, Springer, International Edition.
9. Software Engineering Principles and Practice, Hans Van Vliet,3rd edition, Wiley India edition.
10. Introduction to Software Engineering, R.J.Leach,CRC Press.
11. Software Engineering Fundamentals, Ali Behforooz and Frederick J.Hudson, Oxford University Press, rp2009
12. Software Engineering Handbook, Jessica Keyes, Auerbach, 2003.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1C30

ADVANCED COMPUTER NETWORKS
CORE-3

Objectives:

- The objective of this course is to build a solid foundation in computer networks concepts and design
- To understand computer network architectures, protocols, and interfaces.
- The OSI reference model and the Internet architecture network applications.
- The course will expose students to the concepts of traditional as well as modern day computer networks - wireless and mobile, multimedia-based.
- Students completing this course will understand the key concepts and practices employed in modern computer networking

UNIT I

Computer Networks and the Internet: What Is the Internet?, The Network Edge , The Network Core , Delay, Loss, and Throughput in Packet-Switched Networks , Protocol Layers and Their Service Models, Networks Under Attack

Network Management: What is Network Management?, The Infrastructure for Network Management, The Internet-Standard Management Framework

UNIT II

Application Layer: Principles of Network Applications, Electronic Mail in the Internet, DNS—The Internet's Directory Service

Transport Layer: Introduction and Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control.

UNIT III

The Network Layer: Introduction, Virtual Circuit and Datagram Networks, What's Inside a Router?, The Internet Protocol (IP): Forwarding and Addressing in the Internet , Routing Algorithms, Routing in the Internet, Broadcast and Multicast Routing.

UNIT IV

The Link Layer: Links, Access Networks, and LANs, Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, Data Center Networking,

UNIT V

Wireless and Mobile Networks: Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs, Cellular Internet Access, **Mobility Management**: Principles, Mobile IP, Managing Mobility in Cellular Networks, **Wireless and Mobility**: Impact on Higher-Layer Protocols.

TEXT BOOKS:

1. Computer Networking: A Top Down Approach , *James F. Kurose, Keith W.Ross*, 6th Edition.
2. Data Communications and Networking, *Behrouz A. Forouzan*, Fourth Edition, Tata McGraw Hill
3. High Speed Networks and Internets – Performance and Quality of Service, *William Stallings,* Second Edition, Pearson Education.
4. Top-Down Network Design, *Priscilla Oppenheimer,* Second Edition, Pearson Education (CISCO Press)

REFERENCES:

1. Computer Networks by Mayank Dave, Cengage.
2. Guide to Networking Essentials, *Greg Tomsho, Ed Tittel, David Johnson,* Fifth Edition, Thomson.
3. Computer Networks, *Andrew S. Tanenbaum*, Fourth Edition, Prentice Hall.
4. An Engineering Approach to Computer Networking*, S.Keshav,* Pearson Education.
5. Campus Network Design Fundamentals, *Diane Teare, Catherine Paquet,* Pearson Education (CISCO Press)
6. Computer Communications Networks, Mir, Pearson Education.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1E11

OBJECT ORIENTED MODELING
(ELECTIVE - 1)

Objectives:

- Concisely define the following key terms: class, object, state, behavior, object class, class diagram, object diagram, operation, encapsulation, constructor operation, query operation, update operation, scope operation, association, association role, multiplicity, association class, abstract class, concrete class, class-scope attribute, abstract operation, method, polymorphism, overriding, multiple classification, aggregation, and composition.
- To describe the activities in the different phases of the object-oriented development life cycle.
- State the advantages of object-oriented modeling vis-à-vis structured approaches.
- Compare and contrast the object-oriented model with the E-R and EER models.
- Model a real-world application by using a UML class diagram.
- Provide a snapshot of the detailed state of a system at a point in time using a UML (Unified Modeling Language) object diagram.
- Recognize when to use generalization, aggregation, and composition relationships.
- Specify different types of business rules in a class diagram.

UNIT I

INTRODUCTION • An overview - Object basics - Object state and properties, Behavior, Methods, Messages. • Object Oriented system development life cycle. • Benefits of OO Methodology. 1. Overview of Prominent OO Methodologies: The Rumbaugh OMT. The Booch methodology. Jacobson's OOSE methodologies. Unified Process. Introduction to UML. Important views & diagram to be modeled for system by UML.

Factional view(models): • Use case diagram ,Requirement Capture with Use case. Building blocks of Use Case diagram - actors, use case guidelines for use case models. Relationships between use cases - extend, include, generalize. • Activity diagram : Elements of Activity Diagram - Action state, Activity state, Object. node, Control and Object flow, Transition (Fork, Merge, Join) Guidelines for Creating Activity Diagrams. Activity Diagram - Action Decomposition (Rake). Partition - Swim Lane.

UNIT II

Static structural view (Models): Classes, values and attributes, operations and methods, responsibilities for classes, abstract classes, access specification(visibility of attributes and operations). Relationships among classes: Associations, Dependencies., Inheritance - Generalizations, Aggregation. Adornments on Association: association names, association classes, qualified association, n-ary associations, ternary and reflexive association. Dependency relationships among classes, notations .Notes in class diagram, Extension mechanisms, Metadata, Refinements, Derived , data, constraint, stereotypes, Package & interface notation. Object diagram notations and modeling, relations among objects (links).

UNIT III

Class Modeling and Design Approaches: Three approaches for identifying classes - using Noun phrases, Abstraction, Use Case Diagram. II, Comparison of approaches. Using combination of approaches. Flexibility guidelines for class diagram: Cohesion, Coupling, Forms of coupling (identity, representational, subclass, inheritance), class Generalization, class specialization versus aggregation.

Behavioral (Dynamic structural view): • State diagram : State Diagram Notations, events (signal events, change events, Time events). State Diagram states (composite states, parallel states, History states), transition and condition, state diagram behavior (activity effect, do-activity, entry and exit activity), completion transition, sending signals.

UNIT IV

Interaction diagrams: Sequence diagram - Sequence diagram notations and examples, iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, Activations in sequence diagram. Collaboration diagram - Collaboration diagram notations and examples, iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, activations in sequence diagram.

6. Approaches for developing dynamic systems: Top - down approach for dynamic systems. Bottom - up approach for dynamic systems. Flexibility Guidelines for Behavioral Design - guidelines for allocating and designing behaviors that lead to more flexible design.

UNIT V

Architectural view: Logical architecture: dependency, class visibility, sub systems. Hardware architecture: deployment diagram notations, nodes, object migration between node .Process architecture: what are process and threads and their notations in UML, object synchronization, invocation schemes for threads (UML notations for different types of invocations). Implementation architecture: component diagram notations and examples. Reuse: Libraries, Frame works components and Patterns: a. Reuse of classes. b. Reuse of components. c. Reuse of frameworks, black box framework, white box frame. d. Reuse of patterns: Architectural pattern and Design pattern.

TEXT BOOKS:

1. Designing Flexible Object Oriented systems with UML - Charles Ritcher
2. Object Oriented Analysis & Design, Sat/.inger. Jackson, Burd Thomson
3. Object oriented Modeling and Design with UML - James Rumbaugh. Micheal Blaha (second edition)

REFERENCE BOOKS:

1. The Unified Modeling Language User Guide - Grady Booch, James Rumbaugh, Ivar Jacobson.
2. Object Oriented Modeling and Design - James Rumbaugh
3. Teach Yourself UML in 24 Hours - Joseph Schmuilers
4. Object-Oriented Analysis and Design: using UML Mike O'Docherty Wiley Publication

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1E12

INTERNET TECHNOLOGIES AND SERVICES
(ELECTIVE - 1)

Objective:

The student who has knowledge of programming with java should be able to develop web based solutions using multi-tier architecture. S/he should have good understanding of different technologies on client and server side components as Follows:

Client Side: HTML5, CSS3, Javascript, Ajax, JQuery and JSON
Server Side: Servlets, JSP
Database: MySQL with Hibernate and Connection Pooling
Framework: Struts with validation framework, Internationalization (I18N)
SOA: Service Oriented Architecture, Web services fundamentals, Axis framework for WS

UNIT I

Client Side Technologies: Overview of HTML - Common tags, XHTML, capabilities of HTML5 Cascading Style sheets, CSS3 enhancements, linking to HTML Pages, Classes in CSS Introduction to JavaScripts, variables, arrays, methods and string manipulation, BOM/DOM (Browser/Document Object Model), accessing elements by ID, Objects in JavaScript Dynamic HTML with JavaScript and with CSS, form validation with JavaScript, Handling Timer Events Simplifying scripting with JQuery, JASON for Information exchange.

UNIT II

Introduction to Java Servlets: Introduction to Servlets: Lifecycle of a Servlet, Reading request and initialization parameters, Writing output to response, MIME types in response, Session Tracking: Using Cookies and Sessions, Steps involved in Deploying an application Database Access with JDBC and Connection Pooling Introduction to XML, XML Parsing with DOM and SAX Parsers in Java Ajax - Ajax programming with JSP/Servlets, creating XML Http Object for various browsers, Sending request, Processing response data and displaying it.Introduction to Hibernate

UNIT III

Introduction to JSP: JSP Application Development: Types of JSP Constructs (Directives, Declarations, Expressions, Code Snippets), Generating Dynamic Content, Exception Handling, Implicit JSP Objects, Conditional Processing, Sharing Data Between JSP pages, Sharing Session and Application Data, Using user defined classes with jsp:useBean tag, Accessing a Database from a JSP.

UNIT IV

Introduction to Struts Framework: Introduction to MVC architecture, Anatomy of a simple struts2 application, struts configuration file, Presentation layer with JSP, JSP bean, html and logic tag libraries, Struts Controller class, Using form data in Actions, Page Forwarding, validation frame work, Internationalization.

UNIT V

Service Oriented Architecture and Web Services: Overview of Service Oriented Architecture – SOA concepts, Key Service Characteristics, Technical Benefits of a SOA Introduction to Web Services– The definition of web services, basic operational model of web services, basic steps of implementing web services.Core fundamentals of SOAP – SOAP Message Structure, SOAP encoding, SOAP message exchange models, Describing Web Services –Web Services life cycle, anatomy of WSDL Introduction to Axis– Installing axis web service framework, deploying a java web service on axis. Web Services Interoperability – Creating java and .Net client applications for an Axis Web Service

(Note: The Reference Platform for the course will be open source products Apache Tomcat Application Server, MySQL database, Hibernate and Axis)

TEXT BOOKS:

1. Web Programming, building internet applications, Chris Bates 3rd edition, WILEY Dreamtech .
2. The complete Reference Java 7th Edition , Herbert Schildt., TMH.
3. Java Server Pages,Hans Bergsten, SPD, O'Reilly.
4. Professional Jakarta Struts - James Goodwill, Richard Hightower, Wrox Publishers.
5. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India, rp – 2008.
6. Understanding SOA with Web Services, Eric Newcomer and Greg Lomow, Pearson Edition – 2009
7. Java Web Service Architecture, James McGovern, Sameer Tyagi et al., Elsevier – 2009

REFERENCES:

1. Programming the world wide web,4th edition,R.W.Sebesta,Pearson
2. Core SERVLETS ANDJAVASERVER PAGES VOLUME 1: CORE TECHNOLOGIES , Marty Hall and Larry Brown Pearson
3. Internet and World Wide Web – How to program , Dietel and Nieto PHI/Pearson.
4. Jakarta Struts Cookbook , Bill Siggelkow, S P D O'Reilly.
5. Professional Java Server Programming,S.Allamaraju & othersApress(dreamtech).
6. Java Server Programming ,Ivan Bayross and others,The X Team,SPD
7. Web Warrior Guide to Web Programmming-Bai/Ekedaw-Cengage Learning.
8. Beginning Web Programming-Jon Duckett ,WROX.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1E13

INTERNET OF THINGS
(ELECTIVE - 1)

Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the hardware and working principles of various sensors used for IoT
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

UNIT I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

UNIT II

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT III

IoT Physical Devices and Endpoints - Introduction to Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

UNIT IV

Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, Using unipolar and bipolar Stepper motors

Digital input- Sensing push switch, pull-up and pull-down resistors, Rotary encoder, Using keypad, Using RTC

Sensors: Light sensor, temperature sensor with thermistor, voltage sensor, ADC and ADC, Temperature and Humidity Sensor DHT11, Read Switch, Distance Measurement with ultrasound sensor

UNIT V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOK:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1E14

DATA WAREHOUSING & DATA MINING
(ELECTIVE - 1)

Objectives

- To understand the principles of Data warehousing and Data Mining.
- To be familiar with the Data warehouse architecture and its Implementation.
- To know the Architecture of a Data Mining system.
- To understand the various Data preprocessing Methods.
- To perform classification and prediction of data.

UNIT I

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

UNIT II

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems.

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT III

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT IV

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

UNIT V

Mining Object, Spatial, Multimedia, Text and Web Data:
Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

TEXT BOOK:

1. Jiawei Han, Micheline Kamber and Jian Pei"Data Mining Concepts and Techniques", Third Edition, Elsevier, 2011.

REFERENCE BOOKS:

1. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1E15

ADVANCED PROGRAMMING
(ELECTIVE - 1)

UNIT I

Basic features of Python-Interactive execution,comments,types,variables,operators,expressions, Statements-assignment, input,print,Control flow-Conditionals,Loops,break statement,continue statement, pass statement,Functions,definition,call,scope and lifetime of variables,keyword arguments,default parameter values,variable length arguments,recursive functions,Functional programming-mapping,filtering and reduction,Lambda functions,Scope,namespaces and modules-import statement,creating own modules,avoiding namespace collisions when importing modules, module reload, LEBG rule, dir( ) function, iterators and generators, Sequences-Strings ,Lists and Tuples-basic operations and functions, iterating over sequences, List comprehensions, Packing and Unpacking of Sequences,Sets and Dictionaries- operations, regular expressions, Python program examples.

UNIT II

Files-operations-opening, reading, writing, closing,file positions,file names and paths,functions for accessing and manipulating files and directories on disk, os module, Exceptions – raising and handling exceptions, try/except statements, finally clause, standard exceptions, Object oriented programming- classes, constructors, objects, class variables, class methods, static methods, Inheritance-is-a relationship, composition, polymorphism, overriding, multiple inheritance, abstact classes, multithreaded programming, time and calendar modules,Python program examples.

UNIT III

GUI Programming with Tkinter , Widgets(Buttons, Canvas, Frame, Label, Menu, Entry, Text, Scrollbar, Combobox, Listbox, Scale),event driven programming-events, callbacks, binding, layout management-geometry managers:pack and grid, creating GUI based applications in Python.

UNIT IV

Network Programming-Sockets, Socket addresses, Connection-oriented and Connectionless Sockets,socket module,urllib module,Socket object methods,Client/Server applications(TCP/IP and UDP/IP),Socketserver module, handling multiple clients, Client side scripting-Transferring files-FTP, ftplib module,ftplib.FTP class methods, sending and receiving emails- smtplib module, smtplib.SMTP class methods, poplib module, poplib.POP3 methods, Python program examples.

UNIT V

Database Programming-SQL Databases,SQLite,sqlite3 module, connect function( ),DB-API 2.0 Connection object methods, Cursor object Attributes and methods, creating Database applications in Python, Web programming-Simple web client, urllib, urlparse modules,
Server side scripting-Building CGI applications-Setting up a web server, Creating the form page, Generating the results page, Saving state information in CGI Scripts, HTTP Cookies,
Creating a cookie, Using cookies in CGI scripts, Handling cookies with urllib2 module,
cgi module.

TEXT BOOKS :

1. Exploring Python, Timothy A. Budd, McGraw Hill Publications.
2. Core Python Programming, 2nd edition, W.J.Chun, Pearson.
3. Python Programming, R.Thareja, Oxford University Press.
4. Programming Python, 3rd edition, Mark Lutz, SPD,O'Reilly.

REFERENCE BOOKS :

1. Introduction to Computer Science using Python, Charles Dierbach, Wiley India Edition.
2. Fundamentals of Python, K. A. Lambert, B.L. Juneja, Cengage Learning.
3. Beginning Python,2nd edition, Magnus Lie Hetland, Apress, dreamtech press.
4. Starting out with Python, 3rd edition, Tony Gaddis, Pearson.
5. Python Essential Reference, D.M.Beazley, 3rd edition, Pearson.
6. Programming in Python3, Mark Summerfield, Pearson.
7. Think Python, How to think like a computer scientist, Allen B. Downey,SPD, O'Reilly.
8. www.python.org web site.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1E21

INFORMATION RETRIEVAL SYSTEMS
(ELECTIVE -2)

UNIT I

Introduction to Information Retrieval Systems : Definition of Information Retrieval System, Objectives of Information Retrieval System, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses; Boolean retrieval. The term vocabulary and postings lists. Dictionaries and tolerant retrieval. Index construction. Index compression.

UNIT II

Scoring, term weighting and the vector space model. Computing scores in a complete search system. Evaluation in information retrieval. Relevance feedback and query expansion.

UNIT III

XML retrieval. Probabilistic information retrieval. Language models for information retrieval. Text classification. Vector space classification.

UNIT IV

Support vector machines and machine learning on documents. Flat clustering. Hierarchical clustering. Matrix decompositions and latent semantic indexing.

UNIT V

Web search basics. Web crawling and indexes. Link analysis.

TEXT BOOKS:

1. Introduction to Information Retrieval , Christopher D. Manning and Prabhakar Raghavan and Hinrich Schütze, Cambridge University Press, 2008.
2. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark T Maybury,Springer.

REFERENCES :

1. Modern Information Retrival , Ricardo Baeza-Yates, Pearson Education, 2007.
2. Information Retrieval: Algorithms and Heuristics, David A Grossman and Ophir Frieder, 2nd Edition, Springer, 2004.
3. Information Retrieval Data Structures and Algorithms, William B Frakes, Ricardo Baeza-Yates, Pearson Education, 1992.
4. Information Storage & Retieval , Robert Korfhage , John Wiley & Sons.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1E22

ARTIFICIAL INTELLIGENCE
(ELECTIVE - 2)

Objectives:

- To learn the difference between optimal reasoning Vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

UNIT I
Introduction: What is AI? Foundations of AI, History of AI, Agents and environments, The nature of the Environment, Problem solving Agents, Problem Formulation, Search Strategies

UNIT II
Knowledge and Reasoning: Knowledge-based Agents, Representation, Reasoning and Logic, Prepositional logic, First-order logic, Using First-order logic, Inference in First-order logic, forward and Backward Chaining

UNIT III
Learning: Learning from observations, Forms of Learning, Inductive Learning, Learning decision trees, why learning works, Learning in Neural and Belief networks

UNIT IV
Practical Natural Language Processing: Practical applications, Efficient parsing, Scaling up the lexicon, Scaling up the Grammar, Ambiguity, Perception, Image formation, Image processing operations for Early vision, Speech recognition and Speech Synthesis

UNIT V
Robotics: Introduction, Tasks, parts, effectors, Sensors, Architectures, Configuration spaces, Navigation and motion planning, Introduction to AI based programming Tools

TEXT BOOKS
1. Stuart Russell, Peter Norvig: “Artificial Intelligence: A Modern Approach”,2nd Edition, Pearson Education, 2007

REFERENCES

1. Artificial Neural Networks B. Yagna Narayana, PHI
2. Artificial Intelligence , 2nd Edition, E.Rich and K.Knight (TMH).
3. Artificial Intelligence and Expert Systems – Patterson PHI.
4. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson.
5. PROLOG Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education.
6. Neural Networks Simon Haykin PHI

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1E23

CLOUD COMPUTING
(ELECTIVE -2)

Objectives:

- Cloud computing has evolved as a very important computing model, which enables information, software, and shared resources to be provisioned over the network as services in an on-demand manner.
- This course provides an insight into what is cloud computing and the various services cloud is capable.

UNIT I

Introduction: Computing**,** Distributed Computing, Cluster Computing, Grid Computing, **Fundamentals**: Motivation for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, cloud architecture layers, Principles of Cloud computing, cloud ecosystem, requirements for cloud services, cloud architecture ,cloud application, benefits and drawbacks.

UNIT II

Technological drivers for cloud computing: Introduction SOA and Cloud, Virtualization multicore technology memory and storage technologies, Networking technologies, Web 2.0, Web 3.0 Agile SDLC for cloud computing, how cloud meets agile process?, Application Environments.

UNIT III

Cloud Deployment Models: Introduction private cloud, public cloud, community cloud, hybrid cloud.

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service, Other Cloud Service Models.

UNIT IV

Programming models for cloud computing: Introduction, extended programming models for cloud **,** new programming models proposed for cloud**; software development in cloud:** Introduction Different perspectives on SaaS Development, new challenges, cloud-aware software development using Paas technology.

UNIT V

Cloud Service Providers: EMC, Google,,Amazon Web Services, Microsoft, IBM,SAP Labs, Sales force, Rackspace,VMware,Manjrasoft, **Service level agreements(SLAs) in cloud.**

TEXT BOOKS:

1. Essentials of cloud Computing : K.Chandrasekhran , CRC press, 2014

REFERENCES:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1E24

ADVANCED DATABASES
(ELECTIVE – 2)

Learning Objectives:

- History and Structure of databases, how to design a database
- How to convert the design into the appropriate tables, handling Keys appropriately
- Enforcing Integrity Constraints to keep the database consistent, normalizing the tables to eliminate redundancies
- Querying relational data , Optimizing and processing the queries
- Storage Strategies for easy retrieval of data
- Triggers, Procedures and Cursors, transaction Management

UNIT I

Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, Other Models – Database Languages – DDL,DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, ER diagrams,. Relational Model: Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views –Altering Tables and Views, Relational Algebra, Basic SQL Queries, Nested Queries, Complex Integrity Constraints in SQL, Triggers

UNIT II

Introduction to Schema Refinement – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST, SECOND, THIRD Normal forms – BCNF –Properties of Decompositions- Loss less- join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design – Multi valued Dependencies – FOURTH Normal Form, Join Dependencies, FIFTH Normal form.

UNIT III

Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks – Performance of Locking – Transaction Support in SQL.

Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking.

Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log , Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery

UNIT IV

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing

Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks.

Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM)

B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendable vs. Linear Hashing.

UNIT V

Distributed databases : Introduction to distributed databases, Distributed DBMS architectures ,Storing data in a distributed DBMS, Distributed catalog management, Distributed query processing Updating distributed data, Distributed transactions, Distributed concurrency control ,Distributed recovery

TEXT BOOKS:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition,2003.
2. Data base System Concepts, A.Silberschatz,H.F. Korth, S.Sudarshan,McGraw hill, VI edition,2006.
3. Fundamentals of Database Systems 5th edition., Ramez Elmasri, Shamkant B.Navathe,Pearson Education,2008.

REFERENCE BOOKS:

1. Introduction to Database Systems,C.J.Date,Pearson Education.
2. Database Management System Oracle SQL and PL/SQL,P.K.Das Gupta,PHI.
3. Database System Concepts,Peter Rob & Carlos Coronel,Cengage Learning,2008.
4. Database Systems, A Practical approach to Design Implementation and Management Fourth edition, Thomas Connolly, Carolyn Begg, Pearson education.
5. Database-Principles, Programming and Performance, P.O'Neil&E.O'Neil,2nd ed., ELSEVIER
6. Fundamentals of Relational Database Management Systems, S.Sumathi, S.Esakkirajan, Springer.
7. Introduction to Database Management, M.L.Gillenson and others,Wiley Student Edition.
8. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
9. Distributed Databases Principles & Systems, Stefano Ceri, Giuseppe Pelagatti, TMH.
10. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez, Pearson Education, 2nd Edition.
11. Distributed Database Systems, Chhanda Ray, Pearson.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1E25

OPERATING SYSTEMS SECURITY
(ELECTIVE-2)

Objectives:

- Students will learn and apply basic concepts and methodologies of System Administration and Security by building from the ground up a miniature corporate network.
- To know some basic security measures to take in system administration.
- To prepare for possible disasters, including an understanding of backup and restoration of file systems.

UNIT I
Overview of Operating Systems-Introduction, Computer system organization and architecture, Operating system structure and operations, Process Management, Memory Management, file systems management Protection and security, Scheduling Algorithms, Interprocess Communication (TBI)

UNIT II
Operating Systems Protection: Protection Goals, Protection Threats, Access Control Matrix, Access Control Lists (ACL's), Capability Lists (C-lists), Protection systems, Lampson's access matrix, mandatory protection systems, Reference monitor, Secure operating system definition (TBI)

UNIT III
Operating System Security-Security Goals, Security Threats, Security Attacks- Trojan Horses, Viruses and Worms, Buffer Overflow attacks and Techniques, Formal Aspects of Security, Encryption- Attacks on Cryptographic Systems, Encryption Techniques, Authentication and Password Security, Intrusion detection, malware defences, UNIX and Windows security (TBI)

UNIT IV
System Administration: Security Basics, Securing the Server Itself, Maintenance and Recovery, Monitoring and Audit, Introduction to Linux Systems, Configuration Management, Log Auditing and Vunerability Assessment. (TB2)

UNIT V
Linux Networking: Networking Technologies: DHCP, DNS, NFS/ISCSI, SMTP, SNMP, LAMP, Firewall/IDS/SSH, securing Linux. Case Studies: Security and Protection MULTICSA, UNIX, LINUX and Windows, Windows and Linux Coexisting. (TB3)

TEXT BOOKS:

1. Operating Systems: A Concept –Based Approach, 3rd Edition, Dhananjay M. Dhamdhere, McGraw-Hill, 2015
2. Windows Server 2003 Security, A Technical Reference, Roberta Bragg, Addisson-Wesley 4, Linux Administration Handbook, Second Edition, Evi Nemeth, Garth Snyder, Trent R. Hein. Prentice Hall

REFERENCES:

1. An Introduction to Operating Systems: Concepts and practice, 4th Edition, Promod Chandra P Bhat, Prentice Hall of India, 2014.
2. Operating System: Internals and Design Principles, 7th Edition, William Stalling, Prentice Hall, 2014
3. Linux System Administration, Tom Adelstein and Bill Lubanovic, First Edition, O'Reilly Media, Inc.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1L10

ADVANCED DATA STRUCTURES AND ALGORITHMS THROUGH JAVA LAB (LAB – 1)

Sample Problems on Data structures:

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
   a) Linear search b) Binary search
2. Write Java programs to implement the following using arrays and linked lists
   a) List ADT
3. Write Java programs to implement the following using an array.
   a) Stack ADT b) Queue ADT
4. Write a Java program that reads an infix expression and converts the expression to postfix form. (use stack ADT).
5. Write a Java program to implement circular queue ADT using an array.
6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
7. Write Java programs to implement the following using a singly linked list.
   a) Stack ADT b)Queue ADT
8. Write Java programs to implement the deque (double ended queue) ADT using
   a) Array b) Singly linked list c) Doubly linked list.
9. Write a Java program to implement priority queue ADT.
10. Write a Java program to perform the following operations:
    a) Construct a binary search tree of elements.
    b) Search for a key element in the above binary search tree.
    c) Delete an element from the above binary search tree.
11. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
12. Write a Javaprogram to implement Dijkstra's algorithm for Single source shortest path problem.
13. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
    a) Preorder b) Inorder and c) Postorder.
14. Write Java programs for the implementation of bfs and dfs for a given graph.
15. Write Java programs for implementing the following sorting methods:
    a) Bubble sort d) Merge sort g) Binary tree sort
    b) Insertion sort e) Heap sort

c) Quick sort f) Radix sort

16. Write a Java program to perform the following operations:
    a) Insertion into a B-tree b) Searching in a B-tree
17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

REFERENCES:

1. Data Structures and Algorithms in java,3rd edition, A.Drozdek, Cengage Learning.
2. Data Structures with Java, J.R.Hubbard,2nd edition, Schaum's Outlines,TMH.
3. Data Structures and algorithms in Java, 2nd Edition, R.Lafore, Pearson Education.
4. Data Structures using Java, D.S.Malik and P.S. Nair, Cengage Learning.
5. Data structures, Algorithms and Applications in java, 2nd Edition, S.Sahani, Universities Press.
6. Design and Analysis of Algorithms, P.H.Dave and H.B.Dave, Pearson education.
7. Data Structures and java collections frame work,W.J.Collins,Mc Graw Hill.
8. Java: the complete reference, 7th editon, Herbert Schildt, TMH.
9. Java for Programmers,P.J.Deitel and H.M.Deitel,Pearson education / Java: How to Program P.J.Deitel and H.M.Deitel ,8th edition,PHI.
10. Java Programming,D.S.Malik,Cengage Learning.
11. A Practical Guide to Data Structures and Algorithms using Java, S.Goldman & K.Goldman, Chapman & Hall/CRC, Taylor & Francis Group.

(Note: Use packages like java.io, java.util, etc)

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1L21

OBJECT ORIENTED MODELING LAB
(ELECTIVE – 1 LAB)
(LAB 2)

Objectives:

1. The student should take up the case study of Unified Library application which is mentioned in the theory, and Model it in different views i.e Use case view, logical view, component view, Deployment view, Database design, forward and Reverse Engineering, and Generation of documentation of the project.
2. Student has to take up another case study of his/her own interest and do the same what ever mentioned in first problem. Some of the ideas regarding case studies are given in reference books which were mentioned in theory syllabus can be referred for some idea.

1. Draw the Structural UML diagrams for the specified task
   a) Class diagram
   b) Package diagram
   c) Object diagram
   d) Component diagram
   e) Composite structure diagram
   f) Deployment diagram
2. Draw the Behavioral UML diagrams for the specified task
   a) Activity diagram
   b) Sequence diagram
   c) Use case diagram
   d) State diagram
   e) Communication diagram
   f) Interaction overview diagram
   g) Timing diagram

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1L22

INTERNET TECHNOLOGIES AND SERVICES LAB
(ELECTIVE-1 LAB)
(LAB-2)

Objectives:

- Write syntactically correct HTTP messages and describe the semantics of common HTTP methods and header fields
- Discuss differences between URIs, URNs, and URLs, and demonstrate a detailed understanding of http-scheme URLs, both relative and absolute
- Describe the actions, including those related to the cache, performed by a browser in the process of visiting a Web address
- Install a web server and perform basic administrative procedures, such as tuning communication parameters, denying access to certain domains, and interpreting an access log
- Write a valid standards-conformant HTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms
- Use CSS to implement a variety of presentation effects in HTML and XML documents, including explicit positioning of elements
- Demonstrate techniques for improving the accessibility of an HTML document

List of Sample Problems:

- **Internet Technologies**

1. Develop static pages (using Only HTML) of an online Book store. The pages should resemble: www.amazon.com the website should consist the following pages.
   Home page, Registration and user Login
   User Profile Page, Books catalog
   Shopping Cart, Payment By credit card
   Order Conformation
2. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
3. Create and save an XML document at the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
4. Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using Servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
5. Redo the previous task using JSP by converting the static web pages of assignments 2 into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database. Follow the MVC architecture while doing the website.
6. Implement the “Hello World!” program using JSP Struts Framework.

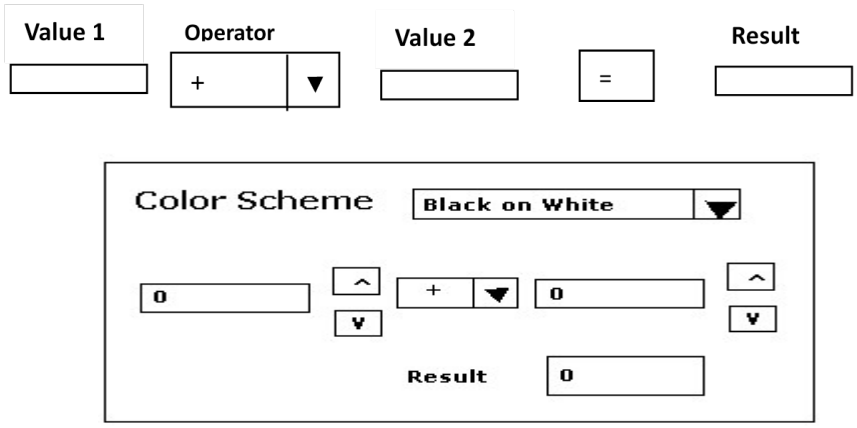
Additional Assignment Problems

1. Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.
2. Write a java swing application that takes a text file name as input and counts the characters, words and lines in the file. Words are separated with white space characters and lines are separated with new line character.
3. Write a simple calculator servlet that takes two numbers and an operator (+, -, /, * and %) from an HTML page and returns the result page with the operation performed on the operands. It should check in a database if the same expression is already computed and if so, just return the value from database. Use MySQL or PostgreSQL
4. Write an HTML page that contains a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
5. Write a servlet that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello <name>, you are not authorized to visit this site" message, where <name> should be replaced with the entered name. Otherwise it should send "Welcome <name> to this site" message.

6. Write a calculator program in HTML that performs basic arithmetic operations (+, -, /, * and %). Use CSS to change the foreground and background color of the values, buttons and result display area separately. Validate the input strings using JavaScript regular expressions. Handle any special cases like division with zero reasonably. The screen may look similar to the following:

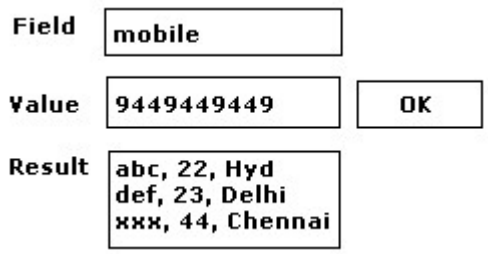
7. Write a Java program that creates a calculator GUI, as shown in figure. Extra components may be added for convenience:

   The Color Scheme may be Black on White or Blue on Yellow (selectable) and accordingly all components colors must be changed. The values can be either entered or increased or decreased by a step of 10. The operators are +, -, / and * (selectable). Once any change takes place, the result must be automatically computed by the program.



8. Write a Java Application that will read an XML file that contains personal information (Name, Mobile Number, age and place. It reads the information using

SAX parser. After reading the information, it shows two input Text Fields in a window, one for tag name and the other for value. Once these two values are given, it should list all the records in the XML file that match the value of the given field in a text area (result box). For example, if the two text boxes are entered with "name" and "ABCD" then it should show all the records for which name is "ABCD"? An Illustration is given below that takes a mobile number and lists all the records that have the same mobile number.



9. Consider the following web application for implementation:
The user is first served a login page which takes user's name and password. After submitting the details the server checks these values against the data from a database and takes the following decisions.
If name and password matches, serves a welcome page with user's full name.
If name matches and password doesn't match, then serves "password mismatch" page
If name is not found in the database, serves a registration page, where users full name, present user name (used to login) and password are collected. Implement this application in:
    1. Pure JSP
    2. Pure Servlets
    3. Struts Framework

10. Implement a simple arithmetic calculator with +, -, /, *, % and = operations using Struts Framework The number of times the calculator is used should be displayed at the bottom (use session variable).

iii)Internet Technologies and Services Lab - Additional Problems

1. Create a web Service in Java that takes two city names from the user and returns the distance between these two from data available from a table in MySql.Write a java and a C# client which use the above service
2. Write a Java program that takes a file as input and encrypts it using DES encryption. The program should check if the file exists and its size is not zero.
3. Write a Java program that generates a key pair and encrypts a given file using RSA algorithm
4. Write a Java program that finds digest value of a given string
5. Consider the following xml file for encryption
<?xml version="1.0"> <transaction> <from>12345</from> <to>54321</to> <amount>10000</amount>
<secretcode>abc123</secretcode> <checksum></checksum> </transaction>
Replace <from> and <to> values with the RSA encrypted values represented with base64 encoding assuming that the public key is available in a file in local directory "pubkey.dat". Encrypt <secretcode> with AES algorithm with a password 'secret'. The checksum of all the

field values concatenated with a delimiter character '+' will be inserted in the checksum and the xml file is written to encrypted.xml file.

6. Assume that a file 'config.xml', which has the following information:
<users>
<user> <name>abc</name> <pwd>pwd123</pwd> <role>admin</role> <md5>xxx</md5> </user>
<user> <name>def</name> <pwd>pwd123</pwd> <role>guest</role> <md5>xxx</md5> </user>
</users>
Replace name and role with DES encrypted values and pwd with RSA encrypted values (represent the values with base64 encoding). The public key is available in "public.key" file in current directory. Replace xxx with respective MD5 values of all the fields for each user. Write the resulting file back to config.xml.
7. Write an HTML page that gives 3 multiple choice (a,b,c and d) questions from a set of 5 preloaded questions randomly. After each question is answered change the color of the question to either green or blue using CSS. Finally on clicking OK button that is provided, the score should be displayed as a pop-up window. Use Java Script for dynamic content
8. Write an HTML page that has 3 countries on the left side ("USA", "UK" and "INDIA") and on the right side of each country, there is a pull-down menu that contains the following entries: ("Select Answer", "New Delhi", "Washington" and "London"). The user will match the Countries with their respective capitals by selecting an item from the menu. The user chooses all the three answers (whether right or wrong). Then colors of the countries should be changed either to green or to red depending on the answer. Use CSS for changing color
9. Write an HTML Page that can be used for registering the candidates for an entrance test. The fields are: name, age, qualifying examination (diploma or 10+2), stream in qualifying examination. If qualifying examination is "diploma", the stream can be "Electrical", "Mechanical" or "Civil". If the qualifying examination is 10+2, the stream can be "MPC" or "BPC". Validate the name to accept only characters and spaces.
10. Write an HTML page that has two selection menus. The first menu contains the states ("AP", "TN" and "KN") and depending on the selection the second menu should show the following items: "Hyderabad", "Vijayawada", "Kurnool" for AP, "Chennai", "Salem", "Madurai" for TN and "Bangalore", "Bellary", "Mysore" for KN.
11. Write an HTML page that has phone buttons 0 to 9 and a text box that shows the dialed number. If 00 is pressed at the beginning, it should be replaced with a + symbol in the text box. If the number is not a valid international number (+ followed by country code and 10 digit phone number) the color of the display should be red and it should turn to green when the number is valid. Consider only "+91, +1 and +44 as valid country codes. Use CSS for defining colors.
12. Write an HTML page that has a text box for phone number or Name. If a number is entered in the box the name should be displayed next to the number. If 00 is pressed at the beginning, it should be replaced with a + symbol in the text box. If a name is entered in the text box, it should show the number next to the name. If the corresponding value is not found, show it in red and show it in green otherwise. Use CSS for colors. Store at least 5 names and numbers in the script for testing

13. A library consists of 10 titles and each title has a given number of books initially. A student can take or return a book by entering his/her HTNo as user ID and a given password. If there are at least two books, the book is issued and the balance is modified accordingly.
    (a) Use RDBMS and implement it with JSP.
    (b) Use XML File for data and Implement it with JSP
    (c) Use RDBMS and implement it with Servlets
    (d) Use XML File for data and Implement it with Servlets
14. A Bus Reservation System contains the details of a bus seat plan for 40 seats in 2x2 per row arrangement, where the seats are numbered from 1 to 40 from first row to last row. The customer can visit the website and can reserve a ticket of his choice if available by entering his details (Name, Address, Gender and Age). The customer can cancel the ticket by entering the seat number and his name as entered for reservation.
    (a) Use RDBMS and implement it with JSP.
    (b) Use XML File for data and Implement it with JSP
    (c) Use RDBMS and implement it with Servlets
    (d) Use XML File for data and Implement it with Servlets
15. Implement a simple messaging system with the following details:
    When a student logs in with his/her HTNO and a given password, they should get all the messages posted to him/her giving the ID of sender and the actual message. Each message may be separated with a ruler. There should be a provision for the user to send a message to any number of users by giving the IDs separated with commas in the "To" text box.
    (a) Use RDBMS and implement it with JSP.
    (b) Use XML File for data and Implement it with JSP
    (c) Use RDBMS and implement it with Servlets
    (d) Use XML File for data and Implement it with Servlets.
16. There is an image of 600x100 size which can be logically divided into 12 button areas with labels (0-9, +, =). Write a javascript calculator program that uses this image as input virtual keyboard and three text areas for two input numbers and result of sum of these numbers. Add a CSS that can be used to change the colors of text and background of text areas and the page. The input numbers can be up to 4 digits each.
17. Develop a web application that takes user name and password as input and compares them with those available in an xml user database. If they match, it should display the welcome page that contains the user's full name and last used date and time retrieved from a client cookie. On logout it stores new time to the cookie and displays a goodbye page. If authentication fails, it should store the attempt number to the client cookie and displays an error page. Add necessary CSS that takes care of the font, color of foreground and background.
18. A web application has the following specifications:
    The first page (Login page) should have a login screen where the user gives the login name and password. Both fields must be validated on client side for a minimum length of 4 characters, name should be lower case a-z characters only and password should contain at least one digit. On submitting these values, the server should validate them with a MySQL database and if failed, show the login page along with a message saying "Login Name or Password Mismatch" in Red color below the main heading and above the form. If successful, show a welcome page with the user's full name (taken from database) and and a link to

Logout. On logout, a good bye page is displayed with the total time of usage (Logout time – login time). Specify the Schema details of table and web.xml file contents.
Implement it using (a) JSP Pages (b) Servlets (c) Struts

19. Design a struts based web portal for an international conference with following specifications:
The welcome page should give the details of the conference and a link to login. If login fails, direct them back for re-login and also provide a link for registration. On successful registration/login, the user will be directed to a page where s/he can see the status (accepted/rejected) of their already submitted papers followed by a form for submitting a doc file to the conference. Provide a logout button on all pages including the home page, once the user logs in. Implement validation framework to check that the user name is in the form of CCDDCC and password is in the form of (CCSDDD) (C for character, S for special character (one of @, #, $, %, ^, & and !) and D for digit)., Database should be accessed through Connection Pool for MySql for user information. Provide scope for internationalization in future. Assume any missing information and mention it first.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1L23

INTERNET OF THINGS LAB
(ELECTIVE-1 LAB)
(LAB-2)

Python Basic exercises

1. Write a Python program that reads 10 integers from keyboard and prints the average of even numbers and odd numbers separately

2. Write a Python program that prints the grade of a student when internal and external marks are given. A candidate is declared Failed (Grade = F), if Total marks < 50 or External marks < 25.

If a candidate is passed, then Grade is given as follows:

Condition	**Grade**
50 <= total marks < 60	E
60 <= total marks < 70	D
70 <= total marks < 80	C
80 <= total marks < 90	B
total marks >= 70	A

3. Create a table in MySQL that stores the status of devices in a house with the following data (Device ID, Device Name and Device State, last altered date and time). Now write a Python program that reads and alters the state of a given device. The date format is "YYYY-MM-DD:HH-mm-ss" where mm is minutes and ss is seconds.

4. Write a Python program that loads all the states of the devices into a dictionary from the table mentioned above.

5. Write a Python program that sorts the device states based on the last altered time

6. Write a Python program that reads a string from keyboard and prints the count of each alphabet in the string.

7. Write a Python program that reads a page from internet and prints it on the screen.

8. Write a Python program that reads and modifies an XML file

9. Write a Python program that reads and alters JSON data from a database table

10. Write a client-server Python program that uses socket connection to implement a time server. The client will connect to the server and the server sends the current time as "YYYY-MM-DD:HH-mm-ss" format. This value should be printed on the client side.

11. Write a Python program that generates 10 random numbers and stores them in a text file one per line. Now write another Python program that reads this data into a list and shows them

12. Write a program that reads key-value pair data from a file and stores them in a database table

13. Write a Python program that reads a time string in the format of "YYYY-MM-DD:HH-mm-ss" and prints its components separately.

14. Write a Python program that reads data from a table and writes it to a text file using tab as field separator and new line as record separator and vice versa.

Raspberry Pi Experiments: *Use Raspberry Pi for all the experiments*

1. Connect an LED to GPIO pin 25 and control it through command line

2. Connect an LED to GPIO pin 24 and a Switch to GPIO 25 and control the LED with the switch. The state of LED should toggle with every press of the switch

3. Use DHT11 temperature sensor and print the temperature and humidity of the room with an interval of 15 seconds

4. Use joystick and display the direction on the screen

5. Use Light Dependent Resistor (LDR) and control an LED that should switch-on/off depending on the light.

6. Create a traffic light signal with three colored lights (Red, Orange and Green) with a duty cycle of 5-2-10 seconds.

7. User rotary encoder and print the position of the shaft on the console

8. Control a servo motor angle that is taken from the keyboard

9. Switch on and switch of a DC motor based on the position of a switch

10. Convert an analog voltage to digital value and show it on the screen.

11. Create a door lock application using a reed switch and magnet and give a beep when the door is opened.

12. Control a 230V device (Bulb) with Raspberry Pi using a relay

13. Control a 230V device using a threshold temperature, using temperature sensor.

14. Simulate an earthquake alarm using vibration sensor and give an alarm when vibration is detected.

15. Create an application that has three LEDs (Red, Green and white). The LEDs should follow the cycle (All Off, Red On, Green On, White On) for each clap (use sound sensor).

16. Create a web application for the above applications wherever possible with suitable modifications to get input and to send output.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1L24

DATA WAREHOUSING & DATA MINING LAB
(ELECTIVE -1 LAB)
(LAB-2)

List of Sample Problems:

Task 1: Credit Risk Assessment

Description:

The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to make as many loans as possible. Interest on these loans is the banks profit source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient.

To do the assignment, you first and foremost need some knowledge about the world of credit. You can acquire such knowledge in a number of ways.
1. Knowledge Engineering. Find a loan officer who is willing to talk. Interview her and try to represent her knowledge in the form of production rules.
2. Books. Find some training manuals for loan officers or perhaps a suitable textbook on finance. Translate this knowledge from text form to production rule form.
3. Common sense. Imagine yourself as a loan officer and make up reasonable rules which can be used to judge the credit worthiness of a loan applicant.
4. Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application.

The German Credit Data:
Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. credit dataset (original) Excel spreadsheet version of the German credit data.
In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer !)

A few notes on the German dataset
• DM stands for Deutsche Mark, the unit of currency, worth about 90 cents Canadian (but looks and acts like a quarter).
• owns_telephone. German phone rates are much higher than in Canada so fewer people own telephones.
• foreign_worker. There are millions of these in Germany (many from Turrkey). It is very hard to get German citizenship if you were not born of German parents.

• There are 20 attributes used in judging a loan applicant. The goal is the classify the applicant into one of two categories, good or bad.

Subtasks : (Turn in your answers to the following tasks)

1. List all the categorical (or nominal) attributes and the real-valued attributes seperately.

2. What attributes do you think might be crucial in making the credit assessment ? Come up with some simple rules in plain English using your selected attributes.

3. One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.

4. Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly ? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy ?

5. Is testing on the training set as you did above a good idea ? Why orWhy not ?

6. One approach for solving the problem encountered in the previous question is using cross-validation ? Describe what is cross-validation briefly. Train a Decistion Tree again using cross-validation and report your results. Does your accuracy increase/decrease ? Why ?

7. Check to see if the data shows a bias against "foreign workers" (attribute 20),or "personal-status" (attribute 9). One way to do this (perhaps rather simple minded) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute you can use the preprocess tab in Weka's GUI Explorer. Did removing these attributes have any significant effect? Discuss.

8. Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the arff data file to get all the attributes initially before you start selecting the ones you want.)

9. Sometimes, the cost of rejecting an applicant who actually has a good credit (case 1) might be higher than accepting an applicant who has bad credit (case 2). Instead of counting the misclassifcations equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the second case. You can do this by using a cost matrix in Weka. Train your Decision Tree again and report the Decision Tree and cross-validation

results. Are they significantly different from results obtained in problem 6 (using equal cost)?

10. Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees ? How does the complexity of a Decision Tree relate to the bias of the model?

11. You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning - Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross-validation (you can do this in Weka) and report the Decision Tree you obtain ? Also, report your accuracy using the pruned model. Does your accuracy increase ?

12. (Extra Credit): How can you convert a Decision Trees into "if-then-else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules - one such classifier in Weka is rules.PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one ! Can you predict what attribute that might be in this dataset ? OneR classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and oneR.

Task Resources:

- Mentor lecture on Decision Trees
- Andrew Moore's Data Mining Tutorials (See tutorials on Decision Trees and Cross Validation)
- Decision Trees (Source: Tan, MSU)
- Tom Mitchell's book slides (See slides on Concept Learning and Decision Trees)
- Weka resources:
    - Introduction to Weka (html version) (download ppt version)
    - Download Weka
    - Weka Tutorial
    - ARFF format
    - Using Weka from command line

Task 2: Hospital Management System

Data Warehouse consists Dimension Table and Fact Table.

REMEMBER The following

Dimension

The dimension object (Dimension):

_ Name
_ Attributes (Levels) , with one primary key
_ Hierarchies

One time dimension is must.

About Levels and Hierarchies

Dimension objects (dimension) consist of a set of levels and a set of hierarchies defined over those levels. The levels represent levels of aggregation. Hierarchies describe parent-child relationships among a set of levels.

For example, a typical calendar dimension could contain five levels. Two hierarchies can be defined on these levels:

H1: YearL > QuarterL > MonthL > WeekL > DayL
H2: YearL > WeekL > DayL

The hierarchies are described from parent to child, so that Year is the parent of Quarter, Quarter the parent of Month, and so forth.

About Unique Key Constraints

When you create a definition for a hierarchy, Warehouse Builder creates an identifier key for each level of the hierarchy and a unique key constraint on the lowest level (Base Level)

Design a Hospital Management system data warehouse (TARGET) consists of Dimensions Patient, Medicine, Supplier, Time. Where measures are ' NO UNITS', UNIT PRICE.

Assume the Relational database (SOURCE) table schemas as follows

TIME (day, month, year),

PATIENT (patient_name, Age, Address, etc.,)

MEDICINE (Medicine_Brand_name, Drug_name, Supplier, no_units, Uinit_Price, etc.,)

SUPPLIER :(Supplier_name, Medicine_Brand_name, Address, etc.,)

If each Dimension has 6 levels, decide the levels and hierarchies, Assume the level names suitably.

Design the Hospital Management system data warehouse using all schemas. Give the example 4-D cube with assumption names.

Similar Tasks Can Be Framed

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1L25

ADVANCED PROGRAMMING LAB
(ELECTIVE – 1 LAB)
(LAB – 2)

Note: The problems given below are only sample problems.

1. Write a Python program that reads a list of names and ages, then prints the list sorted by age.
2. Write a Python program that will prompt the user for a file name, read all the lines from the file into a list, sort the list, and then print the lines in sorted order.
3. Write a Python program that asks the user for a file name, and then prints the number of characters, words, and lines in the file.
4. Write a Python program that will prompt the user for a string and a file name, and then print all lines in the file that contain the string.
5. Create a class Rectangle. The constructor for this class should take two numeric arguments, which are the length and breadth. Add methods to compute the area and perimeter of the rectangle, as well as methods that simply return the length and breadth. Add a method isSquare that returns a Boolean value if the Rectangle is a Square.
6. Write a class Complex for performing arithmetic with complex numbers. The constructor for this class should take two floating-point values. Add methods for adding, subtracting, and multiplying two complex numbers.
7. Write a Python program that converts a fully parenthesized arithmetic expression from infix to postfix.
8. Write a Python program that reads a postfix expression from standard input, evaluates it, and writes the value to standard output.

9. Write a Python program that takes a command-line argument n and writes the number of primes less than or equal to n.

10. Write a Python program that implements binary search method to search for a key in a sorted list.

Sample problems covering data structures:

11. Write Python program to implement the List ADT using a linked list.

12. Write Python programs to implement the deque (double ended queue) ADT using

    a) Array b) Singly linked list c) Doubly linked list.

13. Write a Python program to implement priority queue ADT.

14. Write a Python program to perform the following operations:

    a) Construct a binary search tree of elements.

    b) Search for a key element in the above binary search tree.

    c) Delete an element from the above binary search tree.

15. Write a Python program to implement all the functions of a dictionary (ADT) using Hashing.

16. Write Python programs that use recursive and non-recursive functions to traverse the given binary tree in

    a) Preorder b) Inorder c) Postorder.

17. Write Python programs for implementing the following sorting methods:

    a) Merge sort

    b) Insertion sort e) Heap sort

    c) Quick sort f) Radix sort

18. Write a Python program that counts the occurrences of words in a text file and displays the words in decreasing order of their occurrence counts.

19. Write a Python program that prompts the user to enter a directory or a filename and displays its size.
20. Write a Python program that uses a recursive function to print all the permutations of a string.
21. Write a Python program that prompts the user to enter a directory and displays the number of files in the directory.
22. Suppose the password rules are as follows:
    i) A password must have at least eight characters.
    ii) A password must consist of only letters and digits.
    iii) A password must contain atleast two digits.
    Write a Python program that prompts the user to enter a password (string) and displays whether it is valid or invalid password.
23. Write a Python program to compute n! for large values of n.
24. In data compression, a set of strings is prefix-free if no string is a prefix of another. For example, the set of strings 01, 10, 0010, and 1111 is prefix-free, but the set of strings 01, 10, 0010, 1010 is not prefix-free because 10 is a prefix of 1010. Write a Python program that reads a set of strings from standard input and determines whether the set is prefix-free.

Sample problems covering Networking applications:

25. Write Echo Server and Client programs in Python.
26. Develop Echo Server in Python, one that can handle multiple clients in parallel using forking model on Unix platform.
27. Develop Echo Server in Python, one that can handle multiple clients in parallel using threading model on Unix and Microsoft windows platforms.
28. Develop Echo Server in Python, one that can handle multiple clients in parallel

by multiplexing client connections and the main dispatcher with the select system call.

Here a single event loop can process clients and accept new ones in parallel.

29.Implement in Python client and server-side logic to transfer an arbitrary file from

server to client over a socket.

Sample problems covering GUI applications, Web applications and Database applications:

GUI applications:

1. Write a Python program that works as a simple calculator. Use a grid to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.

2. Develop a Python GUI application that receives an integer in one text field, and computes its factorial Value and fills it in another text field, when the button named “Compute” is clicked.

3. Write a Python program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer Num2 is Zero, the program should Display an appropriate message in the result field in Red color.

4. Write a Python program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time.No light is on when the program starts.

Web Applications

1.Create a registration form with User name, Password and Aadhar Number. Validate the fields for correctness using JavaScript.

2.Create a database for registration and store the submitted values in the local database using serverside Python programs. If user name already exists, send back an error page.

4. Using cookies, display the user's last login time on the welcome page when the user logs into the website.

a) Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.

b) Implement the same program in standalone GUI Program.

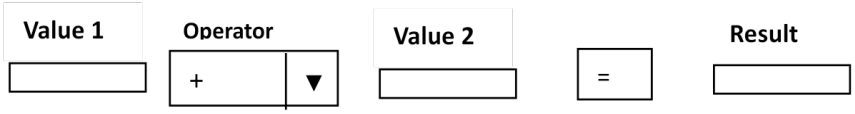
4.Write a Python GUI application that takes a text file name as input and counts the characters, words and lines in the file. Words are separated with white space characters and lines are separated with new line character.

5.Write a simple calculator web application that takes two numbers and an operator (+, -, /, * and %) from an HTML page and sends the result page with the operation performed on the operands. It should check in a database if the same expression is already computed and if so, just return the value from database. Use MySQL or PostgreSQL.

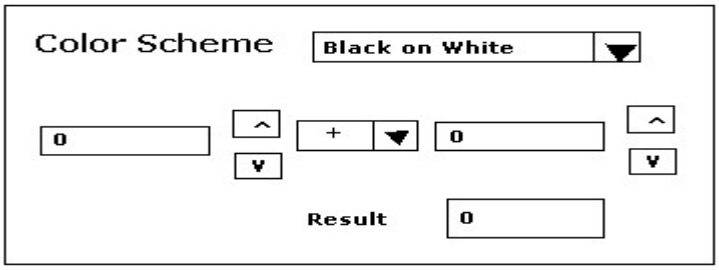
6.Write an HTML page that contains a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).

7.Write a web Python application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello <name>, you are not authorized to visit this site" message, where <name> should be replaced with the entered name. Otherwise it should send "Welcome <name> to this site" message.

8.Write a calculator program in HTML that performs basic arithmetic operations (+, -, /, * and %). Use CSS to change the foreground and background color of the values, buttons and result display area separately. Validate the input strings using JavaScript regular expressions. Handle any special cases like division with zero reasonably. The screen may look similar to the following:



9.Write a Python program that creates a calculator GUI, as shown in figure. Extra components may be added for convenience:



The Color Scheme may be Black on White or Blue on Yellow (selectable) and accordingly all components colors must be changed. The values can be either entered or increased or decreased by a step of 10. The operators are +, -, / and * (selectable). Once any change takes place, the result must be automatically computed by the program.

10.Write a Python Application that will read a text file that contains personal information (Name, Mobile Number, age and place (fields are separated by tabs and records are separated with new line). The first line contains the header with field names. After reading the information, it shows two input Text Fields in a window, one for name and the other for value. Once these two values are given, it should list all the records in the file that match the value of the given field in a text area (result box). For example, if the two text boxes are entered with "name" and "ABCD" then it should show all the records for which name is "ABCD". An Illustration is given below that takes a mobile number and lists all the records that have the same mobile number.

11. Consider the following web application for implementation:

a. The user is first served a login page which takes user's name and password. After submitting the details the server checks these values against the data from a database and takes the following decisions.
b. If name and password matches, serves a welcome page with user's full name.
c. If name matches and password doesn't match, then serves "password mismatch" page
d. If name is not found in the database, serves a registration page, where users full name,

present user name (used to login) and password are collected.

TEXT BOOKS :

1. Exploring Python, Timothy A. Budd, McGraw Hill Publications.

2. Core Python Programming, 2nd edition, W.J.Chun, Pearson.

3. Core Python Application Programming, 3rd edition, W.J.Chun, Pearson.

4. Programming Python, 3rd edition, Mark Lutz, SPD,O'Reilly.

5. The Python 3 Standard Library by Example, Doug Hellmann, Pearson.

6. Introduction to Programming using Python, Y.Daniel Liang, Pearson.

7. Introduction to Programming in Python, R.Sedgewick, K. Wayne and R.Dondero, Pearson.

8. www.python.org web site.

9. Python Programming, R.Thareja, Oxford University Press.

10.Data structures and Algorithms using Python, Rance D.Necaise, Wiley Student edition.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1A11

FOUNDATIONS OF COMPUTER SCIENCE
(AUDIT-1)

Objectives

- To understand the fundamental concepts underlying OOP and apply them in solving problems.
- To learn to write programs in Java for solving problems.
- To understand the functions of Operating systems.
- To understand the Operating system services.
- To learn to use SQL to create, query and update the data in databases.

UNIT I

Java Basics - Java buzzwords, comments, data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, control flow-block scope, conditional statements, loops, break and continue statements, simple java program, arrays, input and output, formatting output, Key attributes of Object Oriented Programming- Encapsulation, Inheritance, Polymorphism, classes, objects, constructors, methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, String handling-building strings, operating on strings, StringBuffer and StringBuilder, Enumerations, autoboxing and unboxing, Generics.

UNIT II

Inheritance – Inheritance concept, benefits of inheritance , Super classes and Sub classes, Member access rules, Inheritance hierarchies, super uses, preventing inheritance: final classes and methods, casting, polymorphism- dynamic binding, method overriding, abstract classes and methods, the Object class and its methods. **Interfaces** – Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface. **Packages-**defining, creating and accessing a Package, understanding CLASSPATH, importing packages.

UNIT III

Exception handling – Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, exception specification, built in exceptions, creating own exception sub classes. **Files** – streams- byte streams, character streams, text Input/output, binary input/output, random access file operations, file management using File class , java.io.

UNIT IV

Operating system Introduction- Operating system objectives and functions, Computer system organization, Computer system Architecture, Operating system structure, Operating system operations (Refer to Chapter 1 of 2nd text book).

Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments (Refer to Chapter 1 of 2nd text book).

Operating system structures-Operating system services, User and Operating system interface, System calls, types of System calls, System programs (Refer to Chapter 2 of 2nd text book).

UNIT V

MySQL(Database)- Introduction to SQL, Data types, Creating Database objects , Querying and Updating Data- Data Definition language (DDL) statements-CREATE,ALTER,DROP and Data Manipulation Language statements(DML)-SELECT,INSERT, UPDATE,DELETE((Refer to Chapter 4 and Chapter 5 of 3rd text book).

TEXT BOOKS :

1. Java: the complete reference, 10th edition, Herbert Schildt, Oracle Press, Mc-Graw Hill Education, Indian Edition.
2. Operating System Concepts, 9th edition, Abraham Silberschatz, P.B. Galvin, G. Gagne, Wiley Student Edition (Refer to Chapter 1 and Chapter 2 only), 2016 India edition.
3. Database Systems, 6th edition, R. Elamasri and S. B. Navathe, Pearson(Refer to Chapter 4 and Chapter 5 only)

REFERENCE BOOKS :

1. Java: How to Program P.Deitel and H.Deitel ,10th edition, Pearson.
2. Java Programming, D.S.Malik, Cengage Learning.
3. Core Java, Volume 1-Fundamentals, 9th edition, Cay S.Horstmann and Gary Cornell, Pearson.
4. Programming in Java, S.Malhotra and S.Choudhary, Oxford Univ. Press.
5. Data base system concepts, A.Silberschatz, H.F. Korth and S.Sudarshan, Mc Graw Hill, VI th edition.
6. Introduction to SQL, Rick F. Van der Lans,4th edition, Pearson.
7. An introduction to programming and OO design using Java, J.Nino, F.A.Hosch, John Wiley&Sons.
8. Operating Systems – Internals and Design Principles, W. Stallings, Pearson.
9. Modern Operating Systems, Andrew S Tanenbaum, 3rd Edition, Pearson.
10. Operating Systems A concept-based Approach, 3rd Edition, D.M. Dhamdhere, TMH.

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1A12

PROFESSIONAL COMMUNICATION SKILLS
(AUDIT-1)

Course Objectives:

- To teach the four language skills - Listening, Speaking, Reading and Writing; critical thinking skills to students.
- To enable students comprehend the concept of communication.
- To help students cultivate the habit of Reading and develop their critical reading skills.

Course Outcomes:

- Students are trained to convert the conceptual understanding of communication into every day practice.
- Students are expected to be ready for placements.
- Students are prepared to communicate their ideas relevantly and coherently in professional writing.

UNIT I
INTRODUCTION

Basics of Communication - Principles of Communication - Types of Communication – Stages of Communication – Verbal and Non-verbal Communication – Channels of Communication – Barriers to Effective Communication – Formal and Informal Expressions in Various Situations.

UNIT II
READING & STUDY SKILLS

Reading Comprehension – Reading Strategies - Skimming and Scanning- Intensive and Extensive Reading– Unknown Passage for Comprehension - Critical Reading of Short Stories – Study Skills – Note Making – Summarizing – Articles and Prepositions – Synonyms and Antonyms

UNIT III

WRITING SKILLS Difference between Spoken and Written Communication- Features of Effective Writing - Formation of a Sentence – SVOs and SVOC patterns – Types of sentences- Common errors in Writing - Writing coherent sentences using connectives and conjunctions- Written Presentation Skills – Tenses – Concord – Question Tags - Practice Exercises - One Word Substitutes – Words Often Confused and Misspelt.

UNIT IV

PROFESSIONAL WRITING Letter writing – Types, Parts and Styles of Formal Letters – Language to be used in Formal Letters – Letters of Enquiry, Complaint, and Apology with Replies – Letter of Application -Resume – E-mail – Active and Passive Voice.

UNIT V

REPORT WRITING

Types of Reports – Formats of Reports – Memo Format – Letter Format and Manuscript Format- Parts of Technical Report – Informational, Analytical and Project Reports – Idioms and Phrases.

REFERENCE BOOKS:

1. Meenakshi Raman & Sangeetha Sharma. 2012. *Technical Communication.* New Delhi
2. Rizvi, M. A. 2005. *Effective Technical Communication.* New Delhi: Tata McGraw Hill
3. Sanjay Kumar & Pushp Latha. 2012. *Communication Skills.* New Delhi: OUP
4. Er. A. K. Jain, Dr. Pravin S. R. Bhatia & Dr. A. M. Sheikh. 2013. *Professional Communication Skills*. S. Chand Publishers. New Delhi.
5. Farhathullah, T.M. 2009. *English for Business Communication.* Bangalore: Prism
6. Bikram K Das. 2011. Functional Grammar and Spoken and Written Communication in English. Kolkata: Orient Blackswan
7. Kiranmai Dutt, P *et al. 2011. A Course in Communication Skills. New Delhi: CUP India*
8. Krishnaswamy, N. 2000. *Modern English – A Book of Grammar, Vocabulary and Usage.* Macmillan India Pvt. Ltd
9. Ramachandran, K K. *et al.* 2007. *Business Communication.* New Delhi: Macmillan
10. Taylor, Ken. 2011. *50 ways to improve your Business English*. Hyderabad: Orient Blackswan

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1A13

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (AUDIT-1)

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

UNIT I

Neetisatakam-Holistic development of personality ,Verses- 19,20,21,22 (wisdom),Verses-29,31,32 (pride & heroism) ,Verses- 26,28,63,65 (virtue) ,Verses- 52,53,59 (dont's) ,Verses-71,73,75,78 (do's)

UNIT II

- Approach to day to day work and duties
- Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT III

- Statements of basic knowledge. ,Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad BhagwadGeeta:Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39 , Chapter18 – Verses 37,38,63

Suggested reading

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, 4. Rashtriya Sanskrit Sansthanam, New Delhi.

M.TECH (SOFTWARE ENGINEERING)

I YEAR I SEMESTER

SE1A14

VALUE EDUCATION
(AUDIT-1)

Course Objectives

Students will be able to

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

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.

UNIT IV
True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT V
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

TEXTBOOK:
1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

M.TECH (SOFTWARE ENGINEERING)
I YEAR I SEMESTER

SE1A15

CONSTITUTION OF INDIA
(AUDIT-1)

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

UNIT I
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution:Preamble Salient Features

UNIT II
Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to Constitutional Remedies Directive Principles of State Policy Fundamental Duties.

UNIT III
Organs of Governance: Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions

UNIT IV
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT - V

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2C10

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS
(CORE – 4)

Objectives:

After completing this course, the student should be able to:

- To understand the concept of patterns and the Catalog.
- To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation and consistency.
- To understand the variety of implemented bad practices related to the Business and Integration tiers.
- To highlight the evolution of patterns.
- To learn how to add functionality to designs while minimizing complexity
- To learn what design patterns really are, and are not
- To know about specific design patterns.
- To learn how to use design patterns to keep code quality high without over design.

UNIT I

Envisioning Architecture: The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. **Creating an Architecture:** Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

UNIT II

Analyzing Architectures: Architecture Evaluation, Architecture design decision making, ATAM, CBAM. **Moving from one system to many:** Software Product Lines, Building systems from off the shelf components, Software architecture in future.

UNIT III

Patterns: Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.**Creational and Structural patterns:** Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight.

UNIT IV

Behavioural patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy. template method, visitor.

UNIT V

Case Studies: A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development

TEXT BOOKS:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education.

REFERENCES:

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006
6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
7. Design Patterns in C#, Steven John metsker, Pearson education, 2004.
8. Pattern Oriented Software Architecture, F.Buschmann &others, John Wiley & Sons.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2C20

SOFTWARE QUALITY ASSURANCE AND TESTING
(CORE – 5)

Objectives:

The student should be able to:

- To understand software testing and quality assurance as a fundamental component of software life cycle
- To define the scope of SW T&QA projects
- To efficiently perform T&QA activities using modern software tools
- To estimate cost of a T&QA project and manage budgets
- To prepare test plans and schedules for a T&QA project
- To develop T&QA project staffing requirements
- To effectively manage a T&QA project

UNIT I

Software Quality Assurance and Standards: The Software Quality challenge, What is Software Quality, Software Quality factors, The components of Software Quality Assurance system, Software Quality Metrics, Costs of Software Quality, Quality Management Standards, Management and its role in Software Quality Assurance, SQA unit and other actors in SQA system. - **(Chapters: 1-4, 21-23, 25, 26) of T3 Quality Standards:** ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma, 6 Sigma and other latest quality standards **(Refer Internet and R11, R12, R13).**

UNIT II

Software Testing Strategy and Environment: Minimizing Risks, Writing a Policy for Software Testing, Economics of Testing, Testing-an organizational issue, Management Support for Software Testing, Building a Structured Approach to Software Testing, Developing a Test Strategy **Building Software Testing Process:** Software Testing Guidelines, workbench concept, Customizing the Software Testing Process, Process Preparation checklist - **(Chapters: 2,3) of T1 Software Testing Techniques:** Dynamic Testing – Black Box testing techniques, White Box testing techniques, Static testing, Validation Activities, Regression testing -**(Chapters: 4, 5, 6, 7, 8) of T2**

UNIT III

Software Testing Tools: Selecting and Installing Software Testing tools – **(Chapter 4) of T1.** Automation and Testing Tools **- (Chapter 15) of T2** Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, JMetra, JUNIT and Cactus. **(Refer Internet and R9, R10)**

UNIT IV

Testing Process Seven Step Testing Process – I: Overview of the Software Testing Process, Organizing of Testing, Developing the Test Plan, Verification Testing, Validation Testing. **(Chapters 6, 7, 8, 9, 10) of T1**

UNIT V

Seven Step Testing Process – II: Analyzing and Reporting Test results, Acceptance and Operational Testing, Post-Implementation Analysis **Specialized Testing Responsibilities**: Software Development Methodologies, Testing Client/Server Systems **(Chapters 12, 13, 14, 15) of T1.**

TEXT BOOKS:

1. Effective Methods for Software Testing, Third edition, *William E. Perry*, Wiley India, 2009
2. Software Testing – Principles and Practices, *Naresh Chauhan,* Oxford University Press, 2010.
3. Software Quality Assurance – From Theory to Implementation, *Daniel Galin,* Pearson Education, 2009.

REFERENCES:

1. The Art of Software Testing, Glenford J.Myers, Tom Badgett & Corey Sandler, Wiley publications, 3rd edition, 2016.
2. Testing Computer Software, Cem Kaner, Jack Falk, Hung Quoc Nguyen, Wiley India, rp2012.
3. Software Testing – Principles, Techniques and Tools, *M.G.Limaye*, Tata McGraw-Hill, 2009.
4. Software Testing - A Craftsman's approach, *Paul C. Jorgensen*, Third edition, Auerbach Publications, 2010.
5. Foundations of Software Testing, *Aditya P. Mathur*, Pearson Education, 2008.
6. Software Testing and Quality Assurance – Theory and Practice, *Kshirasagar Naik, Priyadashi Tripathy*, Wiley India, 2010.
7. Software Testing, *Ron Patton*, Second edition, Pearson Education, 2006.
8. Software Testing and Analysis – Process, Principles and Techniques, *Mauro Pezze, Michal Young,* Wiley India, 2008.
9. Software Testing Techniques, Boris Beizer, Second edition, Wiley India, 2006
10. Foundations of Software Testing, Dorothy Graham, et al., Cengage learning, 2007, rp 2010.
11. Software Testing - Effective Methods, Tools and Techniques, *Renu Rajani, Pradeep Oak*, Tata McGraw-Hill, rp2011.
12. Software Automation Testing Tools for Beginners, *Rahul Shende*, Shroff Publishers and Distributors, 2012.
13. Software Testing Tools, *K.V.K.K. Prasad*, Dream Tech Press, 2008.
14. Software Testing Concepts and Tools, *Nageswara Rao Pusuluri*, Dream Tech press, 2007

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2C30

SOFTWARE REQUIREMENTS AND ESTIMATION
(CORE-6)

Objectives:

- Students will demonstrate knowledge of the distinction between critical and non- critical systems.
- Students will demonstrate the ability to manage a project including planning, scheduling and risk assessment/management.
- Students will author a software requirements document.
- Students will demonstrate an understanding of the proper contents of a software requirements document.
- Students will author a formal specification for a software system.
- Students will demonstrate an understanding of distributed system architectures and application architectures.
- Students will demonstrate an understanding of the differences between real-time and non-real time systems.
- Students will demonstrate proficiency in rapid software development techniques.
- Students will demonstrate proficiency in software development cost estimation
- Students will author a software testing plan.

UNIT I

Software Requirements: What and Why Essential Software requirement, Good practices for requirements engineering, Improving requirements processes, Software requirements and risk management **Software Requirements Engineering** Requirements elicitation, requirements analysis documentation, review, elicitation techniques, analysis models, Software quality attributes, risk reduction through prototyping, setting requirements priorities, verifying requirements quality.

UNIT II

Software Requirements Management Requirements management Principles and practices, Requirements attributes, Change Management Process, Requirements Traceability Matrix, Links in requirements chain **Software Requirements Modeling** Use Case Modeling, Analysis Models, Dataflow diagram, state transition diagram, class diagrams, Object analysis, Problem Frames

UNIT III

Software Estimation Components of Software Estimations, Estimation methods, Problems associated with estimation, Key project factors that influence estimation

Size Estimation

Two views of sizing, Function Point Analysis, Mark II FPA, Full Function Points, LOC Estimation, Conversion between size measures.

UNIT IV

Effort, Schedule and Cost Estimation What is Productivity? Estimation Factors, Approaches to Effort and Schedule Estimation, COCOMO II, Putnam Estimation Model, Algorithmic models, Cost Estimation

UNIT V

Tools for Requirements Management and Estimation Requirements Management Tools: Benefits of using a requirements management tool, commercial requirements management tool, Rational Requisite pro, Caliber – RM, implementing requirements management automation, **Software Estimation Tools:** Desirable features in software estimation tools, IFPUG, USC's COCOMO II, SLIM (Software Life Cycle Management) Tools

TEXT BOOK:

1. Software Requirements and Estimation by *Rajesh Naik and Swapna Kishore*, Tata Mc Graw Hill.

REFERENCE BOOKS:

1. Software Requirements by Karl E. Weigers, Microsoft Press.
2. Managing Software Requirements, Dean Leffingwell & Don Widrig, Pearson Education, 2003.
3. Mastering the requirements process, second edition, Suzanne Robertson & James Robertson, Pearson Education, 2006.
4. Estimating Software Costs, Second edition, Capers Jones, TMH, 2007.
5. Practical Software Estimation, M.A. Parthasarathy, Pearson Education, 2007.
6. Measuring the software process, William A. Florac & Anita D. Carleton,Pearson Education, 1999.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E31

CRYPTOGRAPHY AND NETWORK SECURITY
(ELECTIVE - 3)

Objectives:

- Understand the basic categories of threats to computers and networks
- Understand various cryptographic algorithms.
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
- Discuss Web security and Firewalls

UNIT I

Attacks on Computers and Computer Security: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security **Cryptography: Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT II

Symmetric key Ciphers: Block Cipher principles & Algorithms(DES, AES,Blowfish), Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4,Location and placement of encryption function, Key distribution **Asymmetric key Ciphers:** Principles of public key cryptosystems, Algorithms(RSA, Diffie-Hellman,ECC), Key Distribution

UNIT III

Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm.

UNIT IV

E-Mail Security: Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, key management

UNIT V

Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction **Intruders, Virus and Firewalls:** Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles,

Types of firewalls **Case Studies on Cryptography and security:** Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability, Virtual Elections.

TEXT BOOKS:

1. Cryptography and Network Security : William Stallings, Pearson Education,5th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 2nd Edition.
3. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

REFERENCES:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2nd Edition
3. Information Security, Principles and Practice : Mark Stamp, Wiley India.
4. Principles of Computer Sceurity: WM.Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Principles of Information security by Michael E Whitman and Herbert J.Mattord.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E32

COMPUTER FORENSICS
(ELECTIVE-3)

Objectives:

- To understand the cyberspace
- To understand the forensics fundamentals
- To understand the evidence capturing process.
- To understand the preservation of digital evidence.

UNIT I : Computer Forensics Fundamentals: Introduction to Computer Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps Taken by Computer Forensics Specialists, Who Can Use Computer Forensic Evidence?.**Types of Computer Forensics Technology :** Types of Military Computer Forensic Technology, Types of Law Enforcement Computer Forensic Technology, Types of Business Computer Forensics Technology.

UNIT II : Computer Forensics Evidence and Capture: Data Recovery: Data Recovery Defined, Data Backup and Recovery, The Role of Backup in Data Recovery, The Data-Recovery Solution, Case Histories.**Evidence Collection and Data Seizure:** Why Collect Evidence?, Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collecting and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody.

UNIT III: Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collecting And Preserving Computer Forensic Evidence. **Computer Image Verification and Authentication :** Special Needs of Evidential Authentication, Practical Considerations, Practical Implementation.

UNIT IV: Computer Forensics Analysis: Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool, **Identification of Data:** Timekeeping, Time Matters,Forensic Identification and Analysis of Technical Surveillance Devices. **Reconstructing Past Events**: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. **Networks:** Network Forensics Scenario, A Technical Approach, Destruction of Email, Damaging Computer Evidence, International Principles Against

Damaging of Computer Evidence, Tools Needed for Intrusion Response to the Destruction of Data, Incident Reporting and Contact Forms.

UNIT V: Current Computer Forensics Tools: Evaluating Computer Forensics Tool Needs, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software.

TEXT BOOKS:

1. "Computer Forensics : Computer Crime Scene Investigation", JOHN R. VACCA, Firewall Media.
2. "Guide to Computer Forensics and Investigations"4e, Nelson, Phillips Enfinger, Steuart, Cengage Learning.

REFERENCES:

1. "Computer Forensics and Cyber Crime", Marjie T Britz, Pearson Education.
2. "Computer Forensics", David Cowen, Mc Graw Hill.
3. Brian Carrier , "File System Forensic Analysis" , Addison Wesley, 2005
4. Dan Farmer & Wietse Venema ,"Forensic Discovery", Addison Wesley, 2005
5. Eoghan Casey , ―Digital Evidence and Computer Crime ―, Edition 3, Academic Press, 2011
6. Chris Pogue, Cory Altheide, Todd Haverkos ,Unix and Linux Forensic Analysis DVD ToolKit, Syngress Inc. , 2008
7. Harlan Carvey ,Windows Forensic Analysis DVD Toolkit, Edition 2, Syngress Inc. , 2009
8. Harlan Carvey ,Windows Registry Forensics: Advanced Digital Forensic Analysis of the Windows Registry , Syngress Inc, Feb 2011
9. Eoghan Casey, Handbook of Digital Forensics and Investigation, Academic Press, 2009
10. Gonzales/ Woods/ Eddins, Digital Image Processing using MATLAB, 2nd edition, Gatesmark Publishing, ISBN 9780982085400
11. N.Efford, Digital Image Processing, Addison Wesley 2000, ISBN 0-201-59623-7
12. M Sonka, V Hlavac and R Boyle, Image Processing, Analysis and Machine Vision, PWS
13. 1999, ISBN 0-534-95393-
14. Pratt.W.K., Digital Image Processing, John Wiley and Sons, New York, 1978

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E33

MOBILE APPLICATION DEVELOPMENT
(ELECTIVE-3)

Objectives:

- To demonstrate their understanding of the fundamentals of Android operating systems
- To demonstrate their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

UNIT I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

Unit II

Android User Interface: Measurements – Device and pixel density independent measuring units Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

UNIT V

Advanced Topics: Alarms – Creating and using alarms Using Internet Resources – Connecting to internet resource, using download manager Location Based Services – Finding Current Location and showing location on the Map, updating location.

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCES:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E34

NETWORK PROGRAMMING
(ELECTIVE - 3)

Objectives:

- To understand Linux utilities
- To understand file handling, signals
- To understand IPC, network programming in Java
- To understand processes to communicate with each other across a Computer Network.

UNIT I

Linux Utilities- File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities. Bourne again shell(bash) - Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples.Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

UNIT II

Files- File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown , fchown, links-soft links and hard links – symlink, link, unlink. File and Directory management – Directory contents, Scanning Directories- Directory file APIs. Process- Process concept, Kernel support for process, process attributes, process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

UNIT III

Signals- Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.Interprocess Communication - Introduction to IPC mechanisms, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory.Message Queues- Kernel support for messages, UNIX system V APIs for messages, client/server example.Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.

UNIT IV

Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example. Network IPC - Introduction to Unix Sockets, IPC over a network, Client-Server model ,Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented - Communication, Socket system calls for Connectionless-Communication,

Example-Client/Server Programs- Single Server-Client connection, Multiple simultaneous clients, Socket options – setsockopt, getsockopt, fcntl.

UNIT V

Network Programming in Java-Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs that can handle one connection at a time and multiple connections (using multithreaded server), Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

TEXT BOOKS:

1. Unix System Programming using C++, T.Chan, PHI.(Units II,III,IV)
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.(Unit I)
3. An Introduction to Network Programming with Java, Jan Graba, Springer, 2010.(Unit V)
4. Unix Network Programming ,W.R. Stevens, PHI.(Units II,III,IV)
5. Java Network Programming,3rd edition, E.R. Harold, SPD, O'Reilly.(Unit V)

REFERENCES:

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. UNIX for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson Education.
4. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition.
5. Unix Network Programming The Sockets Networking API, Vol.-I,W.R.Stevens, Bill Fenner, A.M.Rudoff, Pearson Education.
6. Unix Internals, U.Vahalia, Pearson Education.
7. Unix shell Programming, S.G.Kochan and P.Wood, 3rd edition, Pearson Education.
8. C Programming Language, Kernighan and Ritchie, PHI

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E35

DATA SCIENCE
(ELECTIVE-3)

Objectives:

- To understand about Data Science
- To understand big data, to learn the analytics of Big Data how data is stored and processed in Hadoop
- To learn about Machine Learning Algorithms
- To learn model evaluation and how data is analyzed using R features

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UNIT I

Introduction to Data, Data Science, Data Process: Introduction to Data Science and data science process – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields ,data science profile , Types of Digital data: Classification of Digital Data,

Introduction to Big Data: What is big data, Evolution of Big Data, Traditional Business Intelligence vs Big Data, Coexistence of Big Data and Data Warehouse.

UNIT II

Data Collection and Data Preprocessing: Processing data with hadoop, interfacing with hadoop ecosystem.

Hadoop: Features of Hadoop, Key advantages of hadoop, versions of hadoop, overview of hadoop ecosystem, Hadoop distributions.

Why hadoop? RDBMS vs Hadoop, Distribution computing challenges, History of hadoop, Hadoop overview,HDFS NoSQL: Where it is used? What is it? Types of NoSQL Databases, Why NoSQL? Advantages of NoSQL, What we miss with NoSQL? Use of NoSQL in industry,SQL vs NoSQL.

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UNIT III

Exploratory Data Analytics: Descriptive Statistics – Mean, Standard Deviation, dispersion, Skewness and Kurtosis , statistical-interference-Correlation Statistics – ANOVA.

UNIT IV

Algorithms/Model Development: Basic machine learning algorithms, Simple and Multiple Regression – naivebayes, k-.means ,KNN ,decision tree, random forest, LDA ,Prediction and Decision Making, Evaluation Metrics – Cross Validation – Overfitting.

UNIT V

Data Visualization: using R, What is R? Why use R for analytics? How to run R? First R example, functions a short programming example, some important R data structures, vectors, matrices, lists, R programming structures, Charts, pie –charst, Barchart, boxplots, scatterplots ,linechart, Histograms, scatterplots ,Box plot.

TEXT BOOKS:

1. BIG DATA and ANALYTICS, Seema Acharya, Subhashini Chellappan, Wiley Publications.
2. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E36

ADVANCED ALGORITHMS
(ELECTIVE-3)

COURSE OBJECTIVES

- Introduce students to the advanced methods of designing and analyzing algorithms.
- The student should be able to choose appropriate algorithms and use it for a specific problem.
- To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
- Students should be able to understand different classes of problems concerning their computation difficulties.

UNIT I

Flow networks: Flows and Cuts, Maximum Flow- Max-Flow,Min-Cut Theorem, Ford-Fulkerson Algorithm, Edmonds-Karp Algorithm, Maximum Bipartite Matching.Pattern Matching Algorithms: Brute Force Pattern Matching, Knuth-Morris-Pratt Algorithm, Boyer-Moore Algorithm

UNIT II

Backtracking: General method, applications- Eight queens problem, Graph coloring, Hamiltonian cycles.
Branch and Bound: General method, applications - Traveling sales person problem,0/1 knapsack problem-LC Branch and Bound solution, FIFO Branch and Bound solution.

UNIT III

Dynamic Programming: General method, applications-Longest common subsequence problem, 0/1 knapsack problem, All pairs shortest path problem, Chained matrix multiplication.

UNIT IV

Computational Geometry: Range Trees-One dimensional and Two dimensional Range Searching, Priority Search Trees-Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.

UNIT V

Computational Complexity: Complexity classes P and NP, NP-Completeness, NP-Hardness, Some NP-Complete Problems-(Theorems and Proofs)CNF-SAT and 3SAT, Vertex-Cover, The Hamiltonian cycle Problem, Traveling-salesman problem, The Subset-Sum Problem

TEXT BOOKS:

1. Introduction to Algorithms,3rd Edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, PHI Learning Pvt.Ltd.
2. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia, John Wiley and sons.
3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Satraj Sahni and S.Rajasekharan, Universities Press,2008.
4. Algorithm Design, J.Kleinberg and E.Tardos, Pearson(Addison Wesley).

REFERENCE BOOKS:

1. Computer Algorithms, Introduction to Design and Analysis, 3rd Edition, Sara Baase, Allen, Van, Gelder, Pearson Education.
2. Fundamentals of Sequential and Parallel Algorithms, K.A.Berman and J.L.Paul, Cengage Learning.
3. Introduction to the Design and Analysis of Algorithms, A.Levitin, Pearson Education.
4. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson Education,2004.
5. Fundamentals of Algorithmics, G.Brassard and P.Bratley , PHI Learning Pvt. Ltd.
6. How to think about algorithms, Jeff Edmonds, Cambridge University Press.
7. Foundations of Algorithms, 4th Edition, R.Neapolitan and K. Naimipour, Jones and Bartlet Student Edition.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E41

MACHINE LEARNING
(ELECTIVE - 4)

Objectives:

- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To understand the basic theory underlying machine learning.

UNIT I

Introduction: Well-posed learning problems, designing a learning system Perspectives and issues in machine learning

Concept learning and the general to specific ordering: Introduction, A concept learning task, concept learning as search, Find-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination algorithm, Remarks on Version Spaces and Candidate Elimination, Inductive Bias.

Decision Tree Learning: Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

UNIT II

Artificial Neural Networks: Introduction, Neural Network Representation, Appropriate Problems for Neural Network Learning, Perceptrons, Multilayer Networks and the Back propagation Algorithm.

Evaluation Hypotheses: Motivation, Estimation Hypothesis Accuracy, Basics of Sampling Theory, A General Approach for Deriving Confidence Intervals, Difference in Error of Two Hypotheses, Comparing Learning Algorithms.

Bayesian learning: Introduction, Bayes Theorem, Bayes Theorem and Concept Learning Maximum Likelihood and Least Squared Error Hypotheses, Maximum Likelihood Hypotheses for Predicting Probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibs Algorithm, Naïve Bayes Classifier, An Example: Learning to Classify Text, Bayesian Belief Networks, EM Algorithm.

UNIT III

Support Vector Machines: Introduction, The Support Vector Classifier, Support Vector Machines and Kernels, Markov models,Hidden Markov Models.

Instance-Based Learning: Introduction, k-Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

Clustering and Unsupervised Learning: K-means clustering, Gaussian mixture density estimation, model selection

UNIT IV

Genetic Algorithms: Motivation, Genetic Algorithms, An Illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms.

Learning Sets of Rules: Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First-Order Rules, Learning Sets of First-Order Rules:FOIL, Induction as Inverted Deduction, Inverting Resolution.

Reinforcement Learning: Introduction, The Learning Task, *Q*–learning, Non-Deterministic, Rewards And Actions, Temporal Difference Learning, Generalizing from examples, Relationship to Dynamic Programming.

UNIT V

Dimensionality reduction: Feature Selection, Principal Component Analysis, Linear Discriminant Analysis, Factor Analysis, Independent Component Analysis, Multidimensional Scaling, Manifold Learning.

Analytical Learning: Introduction, Learning with Perfect Domain Theories : PROLOG-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operations.

Combining Inductive and Analytical Learning: Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis.

TEXT BOOKS:

1. Machine Learning - Tom M. Mitchell, McGraw Hill, 1997
2. The Elements of Statically Learning - Trevor Has Tie, Robert Tibshirani & Jerome Friedman., Springer Verlag, 2001

REFERENCE BOOKS:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Pattern Classification - Richard o. Duda, Peter E. Hart and David G. Stork, John Wiley & Sons Inc.,2001
3. Neural Networks for Pattern Recognition - Chris Bishop, Oxford University Press, 1995

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E42

HUMAN COMPUTER INTERACTION
(ELECTIVE – 4)

UNIT I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design,

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

Screen Designing:- Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT III

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls.

Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT IV

Software tools – Specification methods, interface – Building Tools.

UNIT V

Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

TEXT BOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
2. Designing the user interface, 3rd Edition Ben Shneidermann , Pearson Education Asia.

REFERENCES:

1. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
3. User Interface Design, Soren Lauesen , Pearson Education.
4. Human –Computer Interaction,D.R.Olsen,Cengage Learning.
5. Human –Computer Interaction,Smith - Atakan,Cengage Learning.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E43

SOFTWARE SECURITY ENGINEERING
(ELECTIVE – 4)

Objectives:

- Students will demonstrate knowledge of the distinction between critical and non-critical systems.
- Students will demonstrate the ability to manage a project including planning, scheduling and risk assessment/management.
- Students will author a software requirements document.
- Students will demonstrate an understanding of the proper contents of a software requirements document.
- Students will author a formal specification for a software system.
- Students will demonstrate an understanding of distributed system architectures and application architectures.
- Students will demonstrate an understanding of the differences between real-time and non-real time systems.
- Students will demonstrate proficiency in rapid software development techniques.
- Students will be able to identify specific components of a software design that can be targeted for reuse.
- Students will demonstrate proficiency in software development cost estimation.
- Students will author a software testing plan.

UNIT I

Security a software Issue: introduction, the problem, Software Assurance and Software Security, Threats to software security, Sources of software insecurity, Benefits of Detecting Software Security

What Makes Software Secure: Properties of Secure Software, Influencing the security properties of software, Asserting and specifying the desired security properties?

UNIT II

Requirements Engineering for secure software: Introduction, the SQUARE process Model, Requirements elicitation and prioritization

UNIT III

Secure Software Architecture and Design: Introduction, software security practices for architecture and design: architectural risk analysis, software security knowledge for architecture and design: security principles, security guidelines and attack patterns

Secure coding and Testing: Code analysis, Software Security testing, Security testing considerations throughput the SDLC

UNIT IV

Security and Complexity: System Assembly Challenges: introduction, security failures, functional and attacker perspectives for security analysis, system complexity drivers and security

UNIT V

Governance and Managing for More Secure Software: Governance and security, Adopting an enterprise software security framework, How much security is enough?, Security and project management, Maturity of Practice

TEXT BOOK:

1. Software Security Engineering: Julia H. Allen, Pearson Education

REFERNCES:

1. Developing Secure Software: Jason Grembi, Cengage Learning
2. Software Security : Richard Sinn, Cengage Learning

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E44

NATURAL LANGUAGE PROCESSING
(ELECTIVE - 4)

Objectives:

- To acquire basic understanding of linguistic concepts and natural language complexity variability.
- To acquire basic understanding of machine learning techniques as applied to language.
- To implement N-grams Models.

UNIT I

Introduction and Overview: What is Natural Language Processing, hands-on demonstrations. Ambiguity and uncertainty in language. The Turing test. **Regular Expressions** Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology. Exploring a large corpus with regex tools. **Programming in Python** An introduction to programming in Python. Variables, numbers, strings, arrays, dictionaries, conditionals, iteration. The NLTK (Natural Language Toolkit) **String Edit Distance and Alignment** Key algorithmic tool: dynamic programming, a simple example, use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction.

UNIT II

Context Free Grammars Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence from both directions **Non-probabilistic Parsing** Efficient CFG parsing with CYK, another dynamic programming algorithms. Early parser. Designing a little grammar, and parsing with it on some test data. **Probability** Introduction to probability theory Joint and conditional probability, independence, Bayes rule. Examples of applications in natural language. **Information Theory** The "Shannon game"--motivated by language! Entropy, crossentropy, information gain. Its application to some language phenomena.

UNIT III

Language modeling and Naive Bayes Probabilistic language modeling and its applications. Markov models. N-grams. Estimating the probability of a word, and smoothing. Generative models of language. Part of Speech Tagging and Hidden Markov Models, Viterbi Algorithm for Finding Most Likely HMM Path Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging.

UNIT IV

Probabilistic Context Free Grammars Weighted context free grammars. Weighted CYK. Pruning and beam search. **Parsing with PCFGs** A tree bank and what it takes to create one. The probabilistic version of CYK. **Maximum Entropy Classifiers** The maximum entropy principle

and its relation to maximum likelihood. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks

UNIT V

Maximum Entropy Markov Models & Conditional Random Fields Part-of-speech tagging, noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines. **Lexical Semantics** Mathematics of Multinomial and Dirichlet distributions. Information Extraction & Reference Resolution- Various methods, including HMMs. Models of anaphora resolution. Machine learning methods for co reference.

TEXT BOOKS:

1. "Speech and Language Processing": Jurafsky and Martin, Prentice Hall
2. "Statistical Natural Language Processing"- Manning and Schutze, MIT Press
3. “Natural Language Understanding”. James Allen. The Benajmins/Cummings Publishing Company

REFERENCES BOOKS:

1. Cover, T. M. and J. A. Thomas: Elements of Information Theory. Wiley.
2. Charniak, E.: Statistical Language Learning. The MIT Press.
3. Jelinek, F.: Statistical Methods for Speech Recognition. The MIT Press.
4. Lutz and Ascher - "Learning Python", O'Reilly

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E45

SOFTWARE AGENTS
(ELECTIVE - 4)

OBJECTIVES:
The objective of this course is to make students to:
1. Learn the principles and fundamentals of designing agents
2. Study the architecture design of different agents.
3. Learn to do detailed design of the agents
4. Explore the role of agents in assisting the users in day to day activities

UNIT I
INTRODUCTION
Agents and Multi Agent Systems-Intelligent Agent-Concepts of Building Agent–Situated Agents– Proactive and Reactive agents-Challenging Agent Environment-Social Agents-Agent Execution Cycle-Prometheus Methodology - Guidelines for using Prometheus - Agent Oriented Methodologies - System Specification – Goal Specification – Functionalities – Scenario Development – Interface Description – Checking for Completeness and Consistency.

UNIT II
ARCHITECTURAL DESIGN
Agent Types - Grouping Functionalities - Agent Coupling - Develop Agent Descriptors – Interactions - Interaction Diagram from Scenarios - Interaction Protocol from Interaction Diagram - Develop Protocol and Message Descriptors – Architectural Design - Identifying the Boundaries of Agent System – Percepts and Action - Shared Data Objects – System Overview – Checking for Completeness and Consistency.

UNIT III
DETAILED DESIGN
Capability Diagrams – Sub Tasks - Alternative Programs – Events and Messages – Action and Percept Detailed Design – Data – Develop and Refine Descriptors – Missing or Redundant Items - Consistency between Artifacts – Important Scenarios - Implementing Agent Systems - Agent Platform – JACK

UNIT IV
AGENTS AND USER EXPERIENCE
Interact with Agents - Agents from Direct Manipulation to Delegation – Interface Agents - Designing Agents - Direct Manipulation versus Agents - Agents for Information Sharing and Coordination - Agents that Reduce Work and Information Overload - KidSim: Programming Agents without a Programming Language.

UNIT V

AGENTS FOR INTELLIGENT ASSISTANCE

Computer Characters - Software Agents for Cooperative Learning – Integrated Agents – Agent Oriented Programming - KQML as an Agent Communication Language - Agent Based Framework for Interoperability - Agents for Information Gathering – KaoS - Communicative Actions for Artificial Agents – Mobile Agents.

TEXT BOOKS:

1. Lin Padgham and Michael Winikoff. Developing Intelligent Agent Systems: A Practical Guide: John Wiley & sons Publication, 2004.
2. Jeffrey M. Bradshaw. Software Agents: MIT Press , 1997. REFERENCE BOOK: Steven F. Rai ls Back and Volker Grimm. Agent – Based and Individual Based modeling: A Practical Introduction: Princeton University Press, 2012.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2E46

ADHOC NETWORKS
(ELECTIVE - 4)

Course objectives:
This course will enable students to

- Explain fundamental principles of Adhoc Networks
- MAC Protocols for Adhoc Wireless Networks
- Routing Protocols for Adhoc Wireless Networks
- Transport Layer Protocols for Ad-hoc Networks
- Security Protocols for Adhoc Networks
- Wireless Sensor Networks

UNIT I

Ad-hoc Wireless Networks: Introduction, Issues in Ad-hoc Wireless Networks, Ad-hoc Wireless Internet; **MAC Protocols for Ad-hoc Wireless Networks:** Introduction, Issues in Designing a MAC Protocol, Design Goals of MAC Protocols, Classification of MAC protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms.

UNIT II

Routing Protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks, Classification of Routing Protocols, Table Driven Routing Protocols; On-Demand Routing Protocols, Hybrid Routing Protocols.

UNIT III

Transport Layer Protocols for Adhoc Networks: Introduction, Issues in Designing a Transport Layer Protocol, Design Goals of a Transport Layer Protocol, Classification of Transport Layer Solutions, TCP over Adhoc Wireless Networks

UNIT IV

Security Protocols for Adhoc Networks: Security in Adhoc Wireless Networks, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Adhoc Wireless Networks.

UNIT V

Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks

TEXT BOOKS:

1. C. Siva Ram Murthy & B. S. Manoj: Adhoc Wireless Networks: Architectures and Protocols, 2nd Edition, Pearson Education, 2011

REFERENCE BOOKS:

1. Ozan K. Tonguz and Gianguigi Ferrari: Ad-hoc Wireless Networks, John Wiley, 2007.
2. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du: Ad-hoc Wireless Networking, Kluwer Academic Publishers, 2004.
3. C.K. Toh: Ad-hoc Mobile Wireless Networks- Protocols and Systems, Pearson

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2L30

SOFTWARE ENGINEERING AND DESIGN PATTERNS LAB
(LAB – 3)

SOFTWARE ENGINEERING Lab

Objectives:

- To understand the software engineering methodologies involved in the phases for project development.
- To gain knowledge about open source tools used for implementing software engineering methods.
- To exercise developing product-startups implementing software engineering methods.

Open source Tools: StarUML / UMLGraph / Topcased

Prepare the following documents and develop the software project startup, prototype model, using software engineering methodology for at least two real time scenarios or for the sample experiments.

1. Problem Analysis and Project Planning -Thorough study of the problem – Identify Project scope, Objectives and Infrastructure.
2. Software Requirement Analysis – Describe the individual Phases/modules of the project and Identify deliverables. Identify functional and non-functional requirements.
3. Data Modeling – Use work products – data dictionary.
4. Software Designing - Develop use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.
5. Prototype model – Develop the prototype of the product.

The SRS and prototype model should be submitted for end semester examination.

List of Sample Experiments:

1. **Student Enrolment System.**

A University has contracted you to develop their new student records system.

The normal tasks that the system performs are as follows:

· Enrol a student at the university: A student provides his or her personal details (name, address, sex, date of birth), along with the code of the course (e.g. Bachelor of Computer Science) in which he or she wishes to enrol. A student record is created, and a unique student ID

number is assigned to the student. The system automatically enrols the student in any core first-year subjects for the course.

· Enrol a student in a subject: A student provides his or her student ID number and the subject code of the subject in which he or she wish to enrol. The system checks that the subject requested by the student is allowed for the course in which the student is enrolled. If not, the enrolment request is rejected. The system checks what subjects (if any) are specified as prerequisites for the subject in which the student wishes to enrol. If the student has passed all the prerequisite subjects, he or she is enrolled in the desired subject. Otherwise, the enrolment request is rejected.

· Record a mark for a student: A staff member accesses the system by giving a subject code and a password for that subject. If the password is correct, the system displays the list of students enrolled in the subject to the staff member. The staff member can then specify a mark for any student on the list.

· Create a new subject: An administrator accesses the system using a password. The administrator then chooses a subject code for the new subject. The system checks that this code is not already in use in the system, and if not, creates a new subject record. The administrator then gives the subject name, the course to which it belongs, the year of the course in which it may first be taken, a flag indicating whether or not it is a core subject and the codes of any prerequisite subjects.

· Print a transcript of a student's results: An administrator accesses the system using a password. The administrator then gives the student ID number of the student for whom the transcript is to be generated. The system contacts the finance system to check whether or not the student has paid all fees. If fees have been paid, the system creates a transcript showing all the subjects in which the student has been enrolled in each year, and the mark for that subject. The header of the transcript shows the student's personal details and the course in which he or she is enrolled.

· Assign a staff member to a subject: An administrator accesses the system using a password. The administrator then gives the subject code for the subject to which the staff member is to be assigned, and the staff ID number of the staff member.

2. **Online Bookshop.**

A major book retailer is planning to develop a computer system to handle their new online bookshop: Booky.com. You have been chosen to do the analysis and design. The following requirements have been identified:

· Customers can search for books on the Booky.com website, either by author name, or words in the title. A list of all matching books is returned to the customer. A customer does not need to be logged-in in order to search.

· The system records all the customers of the Booky.com who have ever logged in. A customer may be an individual customer or a business customer.

· Each customer has a username and password. Business customers may have several usernames and passwords, corresponding to different divisions within the business.

· When a customer has selected a book to buy at the Booky.com website. The system prompts for the customer's username and password. The customer enters these details. The system verifies the customer's identity and retrieves the customer's name and address, then

prompts for credit card details. The customer enters these details. The system checks the credit card details. The system shows the customer the book and delivery price. The customer confirms the transaction.

· The system records all books available at Booky.com. For each book, the author, title and ISBN number are recorded. The number of each book in stock is also stored, along with the number on order by customers and the number on order from publishers. Books may be temporarily unavailable.

· All books are stored in the Booky.com warehouse. The warehouse can be contacted via a secure internet connection.

· For each customer, a permanent record of books bought by that customer is maintained. Likewise, for each book, a record of customers who have bought that book is kept.

· A customer order consists of one or more order lines, each corresponding to a particular book. A customer may choose to defer the shipment of an order until all the order lines have been filled.

· When the warehouse fills all or part of customer order, an email is sent to the customer informing them of what has been shipped.

· If a book ordered by a customer turns out to be unavailable, the corresponding order line is flagged and an email is sent to the customer informing them of the problem. At this stage the customer can cancel this order line.

· When a book corresponding to a previously-unavailable order line becomes available, an email is sent to the customer and a copy of the book is held for seven days, after which it is returned to normal stock if the customer has not confirmed the order.

· The shop keeps track of which publishers produce particular book titles. Some books may be available from more than one publisher.

· Although Booky.com will initially sell only books, it is envisaged that in future it will offer further products, such as CDs. The list of possible future products has not yet been finalized.

3. **Course management system** (CMS)

A **course management system** (CMS) is a collection of software tools providing an online environment for course interactions. A CMS typically includes a variety of online tools and environments, such as:

- An area for faculty posting of class materials such as course syllabus and handouts
- An area for student posting of papers and other assignments
- A gradebook where faculty can record grades and each student can view his or her grades
- An integrated email tool allowing participants to send announcement email messages to the entire class or to a subset of the entire class
- A chat tool allowing synchronous communication among class participants
- A threaded discussion board allowing asynchronous communication among participants

In addition, a CMS is typically integrated with other databases in the university so that students enrolled in a particular course are automatically registered in the CMS as participants in that course.

The Course Management System (CMS) is a web application for department personnel, Academic Senate, and Registrar staff to view, enter, and manage course information formerly submitted via paper.

Departments can use CMS to create new course proposals, submit changes for existing courses, and track the progress of proposals as they move through the stages of online approval.

4. **Easy Leave**

This project is aimed at developing a web based Leave Management Tool, which is of importance to either an organization or a college.

The **Easy Leave** is an Intranet based application that can be accessed throughout the organization or a specified group/Dept. This system can be used to automate the workflow of leave applications and their approvals. The periodic crediting of leave is also automated. There are features like notifications, cancellation of leave, automatic approval of leave, report generators etc in this Tool.

Functional components of the project:

There are registered people in the system. Some are approvers. An approver can also be a requestor. In an organization, the hierarchy could be Engineers/Managers/Business Managers/Managing Director etc. In a college, it could be Lecturer/Professor/Head of the Department/Dean/Principal etc.

Following is a list of functionalities of the system:

1. A person should be able to
    - login to the system through the first page of the application
    - change the password after logging into the system
    - see his/her eligibility details (like how many days of leave he/she is eligible for etc)
    - query the leave balance
    - see his/her leave history since the time he/she joined the company/college
    - apply for leave, specifying the from and to dates, reason for taking leave, address for communication while on leave and his/her superior's email id
    - see his/her current leave applications and the leave applications that are submitted to him/her for approval or cancellation
    - approve/reject the leave applications that are submitted to him/her
    - withdraw his/her leave application (which has not been approved yet)
    - Cancel his/her leave (which has been already approved). This will need to be approved by his/her Superior
    - get help about the leave system on how to use the different features of the system
2. As soon as a leave application /cancellation request /withdrawal /approval /rejection /password-change is made by the person, an automatic email should be sent to the person and his superior giving details about the action
3. The number of days of leave (as per the assumed leave policy) should be automatically credited to everybody and a notification regarding the same be sent to them automatically

An automatic leave-approval facility for leave applications which are older than 2 weeks should be there. Notification about the automatic leave approval should be sent to the person as well as his superior

5. **E-Bidding**

Auctions are among the latest economic institutions in place. They have been used since antiquity to sell a wide variety of goods, and their basic form has remained unchanged. In this dissertation, we explore the efficiency of common auctions when values are interdependent- the value to a particular bidder may depend on information available only to others-and asymmetric.

In this setting, it is well known that sealed-bid auctions do not achieve efficient allocations in general since they do not allow the information held by different bidders to be shared.
Typically, in an auction, say of the kind used to sell art, the auctioneer sets a relatively low initial price. This price is then increased until only one bidder is willing to buy the object, and the exact manner in which this is done varies. In my model a bidder who drops out at some price can "reenter" at a higher price.
With the invention of E-commerce technologies over the Internet the opportunity to bid from the comfort of ones own home has seen a change like never seen before. Within the span of a few short years, what may have began as an experimental idea has grown to an immensely popular hobby, and in some cases, a means of livelihood, the Auction Patrol gathers tremendous response everyday, all day. With the point and click of the mouse, one may bid on an item they may need or just want, and in moments they find that either they are the top bidder or someone else wants it more, and you're outbid! The excitement of an auction all from the comfort of home is a completely different experience.
Society cannot seem to escape the criminal element in the physical world, and so it is the same with Auction Patrols. This is one area wherein a question can be raised as to how safe Auction Patrols.
Proposed system

1. To generate the quick reports
2. To make accuracy and efficient calculations
3. To provide proper information briefly
4. To provide data security
5. To provide huge maintenance of records
6. Flexibility of transactions can be completed in time

6. Electronic Cash counter

This project is mainly developed for the Account Division of a Banking sector to provide better interface of the entire banking transactions. This system is aimed to give a better out look to the user interfaces and to implement all the banking transactions like:

- Supply of Account Information
- New Account Creations
- Deposits
- Withdraws
- Cheque book issues
- Stop payments
- Transfer of accounts
- Report Generations.

Proposed System:
The development of the new system contains the following activities, which try to automate the entire process keeping in view of the database integration approach.

- User friendliness is provided in the application with various controls.
- The system makes the overall project management much easier and flexible.
- Readily upload the latest updates, allows user to download the alerts by clicking the URL.
- There is no risk of data mismanagement at any level while the project development is under process.

It provides high level of security with different level of authentication

7. **Enterprise Security Services**

Verification and Validation is a part of S/W Quality Assurance. Verification refers to the set of activities that ensure correctly implements a specific function. Validation refers to a different set of activities that ensure that the software that has been built is traceable to customer requirements.

Verification:" Are we building the product right"

Validation: "Are we building the right product"

The project entitled Independent Project Metrics is an effort, to develop a tool to manage the Verification and Validation process.

The specific purpose of the Independent Verification and Validation Process o f Project Metrics Tool is to bring out the various Verification and validation tasks to be performed. The scope of the Project Metrics is to cover the developed for system.

The goals of the V&V effort is to ensure that the software and the documents are developed are of high quality as expected from any mission critical software. This project generates the plan for Verification and validation process. This project maintain the document names, source code module names, version number, released date, receiving date size of document and source code modules of receiving projects for Verification and validation.

Using this application we assign the tasks/activities to different persons and also calculate the expected efforts and actual efforts. The V&V co-coordinator does this work.

Proposed System:

The general description gives an "executive overview" and is very client-oriented. It expounds on the functional and data requirements of the application. It also lists the limitations, assumptions and dependencies of the application. It also touches on the performance and quality requirements of the application and provides a solid definition of the interface

The computerization of this system would avoid the wrong interpretation and bad calculation of data .The system help the user to see any documents, source code, tasks, activities, team information with details at the click of a button. The record data is maintained and backed up such a way that data is not loss. The speed of the system could also increased

8.ERP

ERP is a powerful human resource tool for maintaining employee and company information. More than a data storage program, ERP helps you manage your employees. ERP offers a wide variety of reports that give you exactly the information you need. View payroll information by department, or find everyone who is receiving company

Module Description:

1. Payroll
2. Employee
3. Employee payslip
4. Selection process
5. Reports
6. Mailing System
7. Training
8. Add Company Information

PROPOSED SYSTEM

The proposed system is designed to eliminate all the drawbacks of the existing system. The system is part of a large HRMS Application and shall be responsible for maintaining information about employees,

- positions,
- company benefits,
- departments,
- new recruit checklists,
- employee achievements,
- warnings,
- evaluation reports,
- education & training,
- administration,
- work changes and several ad hoc reports.

The major advantage of the proposed system is,

- It's online, so that information is available anytime.
- High integrity and security.
- Ability to incorporate newly available data.
- It is user friendly
- Speed and accuracy is increased
- Fully automated.
- Security is associated with user authentication
- Duplication of information is curbed

9.Examination Branch System

The project **"Examination Branch System** " is developed to reduce the overhead involved in the process of maintains the data and the transaction in the Examination branch **.** Examination branch is an intranet application for an organization. It is software which is used to perform all the examination activities like adding employees, search employees, delete employees and assign examination duties etc.

The basic framework of the project is developed in .NET. Making use of this application the administrator can perform their activities through it.

Proposed System:

- Now we can extend our project to assign duties to faculty.
  We can implement edit, update operations now.
  We can develop our project as a user friendly type

10.Exam Experts

The system would be providing a number of services, automating the processes that are being done manually. The services include communication services such as mailing facility, chat service, electronic file transfer etc and office automation packages such as leave letter processing, admission management, teaching evaluation, counseling automation etc.

The aim of the project is to design a comprehensive web enabled application for management of the Examination Process. Examination system is categorized into various sections. Among those sections, this system concentrates on the work being done in section (E-X).

The section (E-X) deals with the confidential work, i.e., Coding-Decoding of answer scripts, Processing of results, Computerization of certificates etc. This is an automated section and it plays a pivotal role in the Examination Process starting from the Application Processing to the final announcement of results

This project is aimed to solve many of the problems that are in the existing system and also provide a hassle free system that is efficient and easy to use. This project concentrates mainly on

Application Processing, Marks Processing and Results Processing with an easy to use interface. The system also provides a means to generate and print various types of reports.

11.Application Processing System:

This phase involves the storing of the application information and generating the required reports.

- Entry of Application forms according to center ,course order and batch
- Generating Application Id for further transactions
- Capturing of photographs of students for hall ticket processing
- Reports involving the information about students who are appearing for supplementary exams
- Generating nominal roles Reports describing the college, course, subjects and the students appearing

DESIGN PATTERNS LAB

Learning Objective

After completing this course, the student should be able to:

- Understand the concept of patterns and the Catalog.
- Discuss the Presentation tier design patterns and their affect on: sessions, client access, validation and consistency.
- Understand the variety of implemented bad practices related to the Business and Integration tiers.
- Highlight the evolution of patterns.
- How to add functionality to designs while minimizing complexity
- What design patterns really are, and are not
- About specific design patterns.
- What code qualities you need to maintain to keep code flexible.
- How to use design patterns to keep code quality high without overdesign.

List of Sample Problems:

1. Design and execute an application, where “abstract factory” pattern is applied.
2. Design and execute an application, where “adapter” pattern is applied.
3. Design and execute an application, where “bridge” pattern is applied.
4. Design and execute an application, where “command” pattern is applied.
5. Design and execute an application, where “composite” pattern is applied.
6. Design and execute an application, where “facade” pattern is applied.
7. Design and execute an application, where “observer” pattern is applied.
8. Design and execute an application, where “proxy” pattern is applied.
9. Design and execute an application, where “strategy” pattern is applied.
10. Specify and implement the most convenient pattern to apply to the following scenarios:

a) A component on the web tier requires access to business components.
b) There a need to provide several buttons on a web form which executes different actions.
c) Messages need to be sent to citizens each time a typhoon approaches.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2L41

CRYPTOGRAPHY AND NETWORK SECURITY LAB
(ELECTIVE-3 LAB)
(LAB – 4)

The experiments are divided into **Part-A & B.**

PART – A exercises are based on the cryptographic algorithms. They can be implemented using C, C++, Java, etc.

1. Write a Java program to perform encryption and decryption using the following
2. algorithms a. Ceaser cipher b. Substitution cipher c. Hill Cipher
3. Write a C/JAVA program to implement the DES algorithm logic.
4. Write a C/JAVA program to implement the Blowfish algorithm logic.
5. Write a C/JAVA program to implement RSA algorithm.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Using Java cryptography, encrypt the text "Hello world" using Blowfish. Create your
8. own key using Java keytool.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Consider the end user as one of the parties(Alice) and the JavaScript application as the
11. other party(Bob)
12. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
13. Calculate the message digest of a text using the MD5 algorithm in JAVA.

Part – B exercises have to be performed using various software tools/utilities mentioned

1. Passive Information Gathering
- a. IP Address and Domain Identification of log entries – DNS, RIR, etc tools
- b. Information Gathering of a web site: WHOIS, ARIN, etc tools
- c. Banner Grabbing: Netcat, etc tools

2. Detecting Live Systems
- a. Port Scanning : Nmap,SuperScan
- b. Passive Fingerprinting: Xprobe2
- c. Active Fingerprinting: Xprobe2

3. Enumerating Systems
- a. SNMP Enumeration: SolarWinds IP Network Browser, www.solarwinds.com/downloads
- b. Enumerating Routing Protocols: Cain & Abel tool, www.oxid.it

4. Automated Attack and Penetration Tools
- a. Exploring N-Stalker, a Vulnerability Assessment Tool, www.nstalker.com

5. Defeating Malware
- a. Building Trojans, Rootkit Hunter: www.rootkit.nl/projects/rootkit_hunter.html
- b. Finding malware

6. Securing Wireless Systems
- a. Scan WAPs: NetStumbler, www.netstumbler.com/downloads
- b. Capture Wireless Traffic: Wireshark, www.wireshark.org

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2L42

COMPUTER FORENSICS LAB
(ELECTIVE-3 LAB)
(LAB – 4)

To perform the following tasks for the lab, Internet facility and open source tools should be provided.

1. Use a Web search engine, such as Google or Yahoo!, and search for companies specializing in computer forensics. Select three and write a two-to three-page paper comparing what each company does.(Project 1-1)
2. Search the Internet for articles on computer crime prosecutions. Find at least two. Write one to two pages summarizing the two articles and identify key features of the decisions you find in your search. (Project 1-5)
3. Use a Web search engine, search for various computer forensics tools.
4. Preparing and processing of investigations. Try to examine and identify the evidences from the drives. (Project 2-1)
5. Extracting of files that have been deleted.((Project 2-4)
6. Illustrate any Data acquisition method and validate. Use an open source data acquisition tool.
7. You're investigating an internal policy violation when you find an e-mail about a serious assault for which a police report needs to be filed. What should you do? Write a two-page paper specifying who in your company you need to talk to first and what evidence must be turned over to the police.(Project 5-2)
8. Create a file on a USB drive and calculate its hash value in FTK Imager. Change the file and calculate the hash value again to compare the files.(Project 5-4)
9. Compare two files created in Microsoft Office to determine whether the files are different at the hexadecimal level. Keep a log of what you find. (Project 6-1)
10. Illustrate the analysis of forensic data.
11. Illustrate the validating of forensic data.
12. Locate and extract Image (JPEG) files with altered extensions.(Project 10-1)
13. Examine or Investigate an E-mail message.

TEXT BOOKS:

1. "Computer Forensics and Investigations", Nelson, Phillips Enfinger, Steuart, 3rd Edition, Cengage Learning.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2L43

MOBILE APPLICATION DEVELOPMENT LAB
(ELECTIVE-3 LAB)
(LAB – 4)

Objectives:To learn how to develop Applications in android environment.

To learn how to develop user interface applications.
To learn how to develop URL related applications.
The student is expected to be able to do the following problems, though not limited.

1. a. Create an Android application that shows Hello + name of the user and run it on an emulator. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.

2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.

3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.

4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.

5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.

6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.

7. Create a user registration application that stores the user details in a database table.

8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the

user should be verified with the database and an appropriate dialog should be shown to the user.

9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.

10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.

11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.

12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.

13. Create an application that shows the given URL (from a text field) in a browser.

14. Develop an application that shows the current location's latitude and longitude continuously as the device is moving (tracking).

15. Create an application that shows the current location on Google maps.

Note:

Android Application Development with MIT App Inventor:For the first one week, the student is advised to go through the App Inventor from MIT which gives insight into the various properties of each component.

The student should pay attention to the properties of each components, which are used later in Android programming. Following are useful links:

1. http://ai2.appinventor.mit.edu

2. https://drive.google.com/file/d/0B8rTtW_91YclTWF4czdBMEpZcWs/view

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2L44

NETWORK PROGRAMMING LAB
(ELECTIVE-3 LAB)
(LAB – 4)

Objectives:

- To gain hands-on experiences in installing and administering computer systems and networks, in particular, the UNIX version.
- To implement networking and Internet protocols via programming and TCP/IP protocol architecture; user datagram protocol.
- TO implement shell script that accepts a list of files.

LIST OF SAMPLE PROBLEMS/EXPERIMENTS:

1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
2. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
3. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
4. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.
5. Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
6. Write a shell script that accepts any number of arguments and prints them in the reverse order.
7. Write a shell script that determines the period for which a specified user is working on the system.
8. Write a shell script to list all of the directory files in a directory.
9. Write an interactive file-handling shell program- Let it offer the user the choice of copying, removing or linking files. Once the user has made a choice, have the program ask him for the necessary information such as the file name, new name and so on.
10. Write a shell script to find factorial of a given integer.
11. Write a shell script to find the G.C.D. of two integers.
12. Write a shell script to generate a multiplication table.
13. Write a shell script that copies multiple files to a directory.
14. Write a shell script that counts the number of lines and words present in a given file. *15. Write a shell script that displays the list of all files in the given directory.

15. Write a shell script (small calculator) that adds, subtracts, multiplies and divides the given two integers. There are two division options: one returns the quotient and the other returns reminder. The script requires 3 arguments: The operation to be used and two integer numbers. The options are add (-a), subtract (-s), multiply (-m), quotient (-c) and reminder (-r).
16. Write a shell script to reverse the rows and columns of a matrix.
17. Write a sed command that deletes the first character in each line in a file.
18. Write sed command that deletes the character before the last character in each line a file.
19. Write a sed command that swaps the first and second words in each line of a file.
20. Write an awk script that reads a file of which each line has 5 fields – ID, NAME, MARKS1, MARKS2, MARKS3 and finds out the average for each student. Print out the average marks with appropriate messages.
21. Write an awk script to find the factorial of a user supplied number.
22. ls –l command produces long listing of files.
23. Write an awk script 1) to print the selected fields (Ex: size and name of the files) from the file listing. 2) to print the size of all files and number of files.
24. Write an awk script to count the number of lines in a file that do not contain vowels.
25. Write an awk script to find the number of characters, words and lines in a file.
26. Write a c program that makes a copy of a file using
    a. Standard I/O b. System calls.
27. Write a C program that counts the number of blanks in a text file
    a. Using standard I/O b. Using system calls

28. Implement in C the following UNIX commands using system calls
    a. cat b. ls c. mv

29. Write a program that takes one or more file/directory names as command line input and reports the following information on the file.
    i. File type.
    ii. Number of links.
    iii. Time of last access.
    iv. Read, Write and Execute permissions.
30. Write a c program to emulate the UNIX ls –l command.
31. Write a c program that creates a directory, puts a file into it, and then removes it.
32. Write a c program that searches for a file in a directory and reports whether the file is present in the directory or not.
33. Write a c program to list for every file in a directory, its inode number and file name.
34. Write a c program that creates a file containing hole which is occupying some space but having nothing.
35. Write a c program that demonstrates redirection of standard output to a file.
    Ex: ls > f1.

36. Write a c program to create a child process and allow the parent to display “parent” and the child to display “child” on the screen.
37. Write a c program to create a Zombie process.
38. Write a c program that illustrates how an orphan is created.

39. Write a c program that creates a child process to execute a command. The command to be executed is passed on the command line.
40. Write a c program that accepts two small numbers as arguments and then sums the two numbers in a child process. The sum should be returned by child to the parent as its exit status and the parent should print the sum.
41. Write a c program that illustrates how to execute two commands concurrently with a command pipe. Ex:- ls –l | sort
42. Write c programs that illustrate communication between two unrelated processes using named pipe.
43. Write a c program in which a parent writes a message to a pipe and the child reads the message.
44. Write a c program that illustrates suspending and resuming processes using signals.
45. Write a c program that displays the real time of a day every 60 seconds, 10 times.
46. Write a c program that runs a command that is input by the user and prints the exit status if the command completes in 5 seconds. If it doesn't, then the parent uses kill to send a SIGTERM signal to kill the child process.
47. Write a C program that illustrates file-locking using semaphores.
48. Write a C program that implements a producer-consumer system with two processes. (Using semaphores).
49. Write client and server programs (using C) for
    a. Interaction between server and client processes using Unix Domain Sockets.
    b. Interaction between server and client processes using Internet Domain Sockets.
50. Write a C program (sender.c)
    i. To create a message queue with read and write permissions.
    ii. To write 3 messages to it with different priority numbers.
51. Write a C program (receiver.c) that receives the messages (from the above message queue as specified in 63.a) and displays them.
52. Write C program that illustrates two processes communicating via shared memory.
53. Design TCP iterative Client and server application to reverse the given input sentence
54. Design TCP iterative Client and server application to reverse the given input sentence
55. Design TCP client and server application to transfer file
56. Design a TCP concurrent server to convert a given text into upper case using multiplexing system call "select"
57. Design a TCP concurrent server to echo given set of sentences using poll functions
58. Design UDP Client and server application to reverse the given input sentence
59. Design UDP Client server to transfer a file
60. Design using poll client server application to multiplex TCP and UDP requests for converting a given text into upper case.
61. Design a RPC application to add and subtract a given pair of integers

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2L45

DATA SCIENCE LAB
(ELECTIVE-3 LAB)
(LAB-4)

Objectives

- To make students understand learn about a Big Data –R Programming , way of solving problems.
- To teach students to write programs in Rstudio to solve problems with predefined R Packages. On synthetic datasets

Introduction to R Programming:

What is R and RStudio? R is a statistical software program. It has extremely useful toolsfor data exploration, data analysis, and data visualization. It is flexible and also allows for a dvanced programming. RStudio is a user interface for R, which provides a nice environment for working with R.

1. Write an R program to evaluate the following expression ax+b/ax-b.
2. Write an R program to read input from keyboard(hint: readLine()).
3. Write an R program to find the sum of n natural numbers: 1+2+3+4+….n
4. Write an R program to read n numbers.
(i) Sum of all even numbers (ii) Total number of even numbers.
5. Write an R program to read n numbers.
(i) Total number of odd numbers (ii) Sum of all odd numbers
6. Write an R program to to obtain
(i)sum of two matrices A and B (ii) subtraction of two matrices A and B
(iii) Product of two matrices.
7. Write an R program for " declaring and defining functions "
8. Write an R program that uses functions to add n numbers reading from keyboard
9. Write an R program uses functions to swap two integers.
10. Write an R program that use both recursive and non-recursive functions for implementing the Factorial of a given number, n .
11. Write an R program to reverse the digits of the given number .{ example 1234 to
12. Write an R program to implement
(i)Linear search (ii) Binary Search.
13. Write an R program to implement
(i)Bubble sort (ii) selection sort .
14. Write a R program to implement the data structures
(i) Vectors (ii) Array (iii) Matrix (iv) Data Frame (v) Factor
15. Graphical Analysis: Creating a simple graph, Modifying the plots and lines of a graph. Modifying Title and Subtile, Modifying Axes of a Graph, Adding Legend on a Graph, Special Graphs (Using pie charts, barplot, histograms scatter plots), Multiple Plots.

16. **Descriptive Statistics:** Measure of Central Tendency (Mean, Median and Mode), Measure of Positions (Quartiles, Deciles, Percentiles and Quantiles), Measure of Dispersion (Range, Median, Absolute deviation about median, Variance and Standard deviation), Measure of Distribution

(Skewness and Kurtosis), Box and Whisker Plot (Box Plot and its parts, Using Box Plots to compare distribution).

17.Construct classification and regression trees

18.Implement K-Means and Hierarchical
19. Experiments based on Linear Regression and Multiple Linear Regression Methods.
20.Implement K-nearest neighbors and Linear Discriminant Analysis.
21 . Implement Leave-One-Out Cross-Validation and k-Fold cross-validation on any simulated data set.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2L46

ADVANCED ALGORITHMS LAB
(ELECTIVE-3 LAB)
(LAB-4)

Write the programs in Java for implementing the following:

1. Prim's greedy algorithm to generate minimum cost spanning tree.
2. Kruskal's greedy algorithm to generate minimum cost spanning tree.
3. Huffman's greedy algorithm for producing an optimal binary character code.
4. Dijkstra's greedy algorithm for Single source shortest path problem.
5. Floyd's dynamic programming algorithm for the All pairs shortest path problem.
6. Greedy algorithm for job sequencing with deadlines.
7. Dynamic Programming algorithm for the chained matrix multiplication.
8. Dynamic Programming algorithm for the longest common subsequence problem.
9. Dynamic Programming algorithm for 0/1 Knapsack problem.
10. Backtracking algorithm for the 8-queens problem.
11. Backtracking algorithm for the Hamiltaonian cycles problem.
12. Backtracking algorithm for the m-colourings graph problem.
13. Knuth-Morris-Pratt Pattern matching algorithm.
14. Boyer-Moore Pattern matching algorithm.
15. Branch-and-Bound algorithm for the TSP to find an optimal tour and the length of the optimal tour for a given graph.
16. Branch-and-Bound algorithm for the 0-1 Knapsack problem to maximize the profit for a given problem instance.
17. Ford-Fulkerson algorithm for computing a maximum flow in a network.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2A11

ENGLISH FOR RESEARCH PAPER WRITING
(AUDIT-2)

Course objectives:
Students will be able to:
1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title
Ensure the good quality of paper at very first-time submission

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

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

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2A12

DISASTER MANAGEMENT
(AUDIT-2)

Course Objectives: -

Students will be able to:

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. 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

UNIT I

Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade 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, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III

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

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, PardeepEt.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.

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2A13

SOFT SKILLS
(AUDIT-II)-(Activity-based)

Course Objectives

- To improve the fluency of students in English
- To facilitate learning through interaction
- To illustrate the role of skills in real-life situations with case studies, role plays etc.
- To train students in group dynamics, body language and various other activities which boost their confidence levels and help in their overall personality development
- To encourage students develop behavioral skills and personal management skills
- To impart training for empowerment, thereby preparing students to become successful professionals

Learning Outcomes

- Developed critical acumen and creative ability besides making them industry- ready.
- Appropriate use of English language while clearly articulating ideas.
- Developing insights into Language and enrich the professional competence of the students.
- Enable students to meet challenges in job and career advancement.

Unit 1 : INTRODUCTION

Definition and Introduction to Soft Skills – Hard Skills vs Soft Skills – Significance of Soft/Life/Self Skills – Self and SWOT Analysis ***and***

1. **Exercises on Productivity Development**
   - Effective/ Assertive Communication Skills (Activity based)
   - Time Management (Case Study)
   - Creativity & Critical Thinking (Case Study)
   - Decision Making and Problem Solving (Case Study)
   - Stress Management (Case Study)
2. **Exercises on Personality Development Skills**

- Self-esteem (Case Study)
- Positive Thinking (Case Study)
- Emotional Intelligence (Case Study)
- Team building and Leadership Skills (Case Study)
- Conflict Management (Case Study)

3. **Exercises on Presentation Skills**

- Netiquette
- Importance of Oral Presentation – Defining Purpose- Analyzing the audience- Planning Outline and Preparing the Presentation- Individual & Group Presentation- Graphical Organizers- Tools and Multi-media Visuals
- One Minute Presentations (Warming up)
- PPT on Project Work- Understanding the Nuances of Delivery- Body Language – Closing and Handling Questions – Rubrics for Individual Evaluation (Practice Sessions)

4. **Exercises on Professional Etiquette and Communication**

- Role-Play and Simulation- Introducing oneself and others, Greetings, Apologies, Requests, Agreement & Disagreement….etc.
- Telephone Etiquette
- Active Listening
- Group Discussions (Case study)- Group Discussion as a part of Selection Procedure- Checklist of GDs
- Analysis of Selected Interviews (Objectives of Interview)
- Mock-Interviews (Practice Sessions)
- Job Application and Preparing Resume
- Process Writing (Technical Vocabulary) – Writing a Project Report- Assignments

5. **Exercises on Ethics and Values**

Introduction — Types of Values - Personal, Social and Cultural Values - Importance of Values in Various Contexts

- Significance of Modern and Professional Etiquette – Etiquette (Formal and Informal Situations with Examples)
- Attitude, Good Manners and Work Culture (Live Examples)
- Social Skills - Dealing with the Challenged (Live Examples)
- Professional Responsibility – Adaptability (Live Examples)
- Corporate Expectations

- Note: Hand-outs are to be prepared and given to students.
- Training plan will be integrated in the syllabus.
- Topics mentioned in the syllabus are activity-based.

SUGGESTED SOFTWARE:

- The following software from **'train2success.com'**

- Preparing for being Interviewed
- Positive Thinking
- Interviewing Skills
- Telephone Skills
- Time Management
- Team Building
- Decision making

SUGGESTED READING

1. Alex, K. 2012. *Soft Skills.* S. Chand Publishers
2. Naterop, B. Jean and Revell, Rod. 2004. *Telephoning in English*. Cambridge: CUP
3. Patnaik, P. 2011. *Group Discussion and Interview Skills.* New Delhi: Foundation
4. Rizvi, M. A. 2005. *Effective Technical Communication.* New Delhi: Tata McGraw Hill
5. Sasikumar, V & Dhamija, P.V. 1993. *Spoken English - A Self-Learning Guide to Conversation Practice.* New Delhi: Tata McGraw-Hill
6. Sudhir Andrews. 2009. *How to Succeed at Interviews.* New Delhi: Tata McGraw Hill
7. Vivekananda: His Call to the Nation : a Compilation R.K. Math Publication

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2A14

STRESS MANAGEMENT BY YOGA
(AUDIT-2)

Course Objectives
1. To achieve overall health of body and mind
2. To overcome stress

UNIT I
Definitions of Eight parts of yog. (Ashtanga)

UNIT II
Yam and Niyam.
Do`s and Don't's in life.
a) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

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

Suggested Reading:

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2A15

SANSKRIT FOR TECHNICAL KNOWLEDGE
(AUDIT-2)

Course Objectives:

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

UNIT I

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

UNIT II

Order
Introduction of roots
Technical information about Sanskrit Literature

UNIT III

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

Suggested Reading:

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

M.TECH (SOFTWARE ENGINEERING)
I YEAR II SEMESTER

SE2A16

RESEARCH METHODOLOGY
(AUDIT – 2)

UNIT I

Introduction:

Objectives of Research; Definition and Motivation; Types of Research; Research Approaches; Steps in Research Process; Criteria of Good Research, Ethics in Research.

Research Formulation and Literature Review:

Problem Definition and Formulation; Literature Review; Characteristics of a Good Research Question; Literature Review Process.

UNIT II

Data Collection:

Primary and Secondary Data; Primary and Secondary Data Sources; Data Collection Methods; Data Processing; Classification of Data.

Basic Statistical Measures:

Types of Scales; Measures of Central Tendency; Skewness; Measure of Variation; Probability Distribution.

UNIT III

Data Analysis:

Statistical Analysis; Multivariate Analysis; Correlation Analysis; Regression Analysis; Principle Component Analysis; Sampling.

Research Design:

Need for Research Design; Features of a Good Design; Types of Research Designs; Induction and Deduction.

UNIT IV

Hypothesis Formulation and Testing:

Hypothesis; Important Terms; Types of Research Hypothesis; Hypothesis Testing; Z-Test; t-Test; f-Test; Making a Decision: Types of Errors; ROC Graphics.

Test Procedures:

Parametric and Non-parametric Tests; ANOVA; Mann-Whitney Test; Kruskal-Wallis Test; Chi-Square Test; Multi-Variate Analysis.

UNIT V

Models for Science and Business:

Algorithmic Research; Methods of Scientific Research; Modelling; Simulations; Industrial Research.

Presentation of the Research Work:

Business Report; Technical Report; Research Report; General Tips for Writing Report; Presentation of Data; Oral Presentation; Bibliography and References; Intellectual Property Rights; Open-Access Initiatives; Plagiarism.

TEXT BOOK:

1. Research Methodology - Pearson Publications – S.S. Vinod Chandra; S. Anand Hareendran

REFERENCE BOOKS:

1. Research Methodology - David V. Thiel
2. Research Methodology - R. Panner Selvam

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3E51

SOFTWARE PROCESS AND PROJECT MANAGEMENT
(ELECTIVE – 5)

Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project.
- To compare and differentiate organization structures and project structures.
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.

UNIT I

Software Process Maturity : Software maturity Framework**,** Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process. **Process Reference Models** Capability Maturity Model (CMM)**,** CMMi, PCMM, PSP, TSP.

UNIT II

Software Project Management Renaissance Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. **Life-Cycle Phases and Process artifacts** Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model based software architectures.

UNIT III

Workflows and Checkpoints of process Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments.**Process Planning** Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT IV

Project Organizations Line-of- business organizations, project organizations, evolution of organizations, process automation. **Project Control and process instrumentation** The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

UNIT V

Agile Programming: Why Agile, How to be Agile, Understanding Extreme Programming
CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

TEXT BOOKS:

1. Managing the Software Process, *Watts S. Humphrey*, Pearson Education.
2. Software Project Management, *Walker Royce,* Pearson Education.
3. The Art of Agile Development, James Shore and Shane Warden, O'Reilly

REFERENCES:

1.Effective Project Management: Traditional, Agile, Extreme, Robert Wysocki, Sixth edition, Wiley India, rp2011.
2.An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
5.Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
6.Software Engineering Project Managent, Richard H. Thayer & Edward Yourdon, 2nd edition, Wiley India, 2004.
7.The Art of Project Management, Scott Berkun, SPD, O'Reilly, 2011.
8.Applied Software Project Management, Andrew Stellman & Jennifer Greene, SPD, O'Reilly, rp2011.
9. Process Improvement essentials, James R. Persse, O'Reilly, 2006
10. DevelopmentAgile Project Management, Jim Highsmith, Pearson Education, 2004.

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3E52

SEMANTIC WEB AND SOCIAL NETWORKS
(ELECTIVE –5)

Course Objectives:

- To learn Web Intelligence
- To learn Knowledge Representation for the Semantic Web
- To learn Ontology Engineering
- To learn Semantic Web Applications, Services and Technology
- To learn Social Network Analysis and semantic web

UNIT I

Web Intelligence: Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

UNIT II

Knowledge Representation for the Semantic Web:Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

UNIT III

Ontology Engineering:Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

UNIT IV

Semantic Web Applications, Services and Technology:Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods,

UNIT V

Social Network Analysis and semantic web: What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

TEXT BOOKS:

1. Thinking on the Web – Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

REFERENCE BOOKS:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3. Information sharing on the semantic Web – Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
4. Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O'Reilly, SPD.

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3E53

BIG DATA
(ELECTIVE – 5)

Objectives:
To understand about big data, to learn the analytics of Big Data
To understand how data is stored and processed in Hadoop
To learn about NoSQL databases
To learn R tool and understand how data is analyzed using R features
To learn about spark and to understand what features of it are making it to overtake hadoop

UNIT I
Types of Digital data: Classification of Digital Data,
Introduction to Big Data: What is big data, Evolution of Big Data, Traditional Business Intelligence vs Big Data, Coexistence of Big Data and Data Warehouse.
Big Data Analytics: What is Big Data Analytics, What Big Data Analytics Isn't, Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data, Top Challenges Facing Big Data, Why Big Data Analytics Important, Data Science, Terminologies used in Big Data Environments.

UNIT II
Hadoop: Features of Hadoop, Key advantages of hadoop, versions of hadoop, overview of hadoop ecosystem, Hadoop distributions.
Why hadoop? RDBMS vs Hadoop, Distribution computing challenges, History of hadoop, Hadoop overview,HDFS

UNIT III
Processing data with hadoop, interfacing with hadoop ecosystem.
NoSQL: Where it is used? What is it? Types of NoSQL Databases, Why NoSQL? Advantages of NoSQL, What we miss with NoSQL? Use of NoSQL in industry,SQL vs NoSQL.

UNIT IV
What is R? Why use R for analytics? How to run R? First R example, functions a short programming example, some important R data structures, vectors, matrices, lists, R programming structures.

UNIT V
Introduction to Spark, Scala language: values, data types, variables, expressions, conditional expressions, evaluation order, compound expressions, functions, tuple with functions, List, Length, ++, ::, sorted, reverse, sum. slice, mkString, contains, map, filter, leftfold, reduce,
Map, Contains, getOrElse, WithDefault, Keys and Values, groupBy, set, mapValues, keys and values, Option(Some and None), Objects, classes, inheritance, traits

TEXT BOOKS

1. BIG DATA and ANALYTICS, Seema Acharya, Subhashini Chellappan, Wiley publications.(Unit I, II, III)
2. BIG DATA, Black BookTM , DreamTech Press, 2015 Edition. 81
3. “The art of R programming” by Norman matloff, 2009.(Unit IV)
4. “Atomic Scala”, 2nd edition, Bruce Eckel, Dianne Marsh. (Unit V)

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3E54

SOFTWARE RELIABILITY
(ELECTIVE – 5)

COURSE OBJECTIVES:

1. To learn about the engineering techniques for developing and maintaining reliable software systems.
2. To measure the reliability of software systems.
3. To understand about fault prevention, fault removal, fault tolerance and failure forecasting in software systems.
4. To learn different time dependent and time independent software reliability models and design reliability models for software systems.

UNIT I

Basic Ideas of Software Reliability, Hardware reliability vs. Software reliability, Reliability metrics, Failure and Faults – Prevention, Removal, Tolerance, Forecast, Dependability Concept – Failure Behaviour, Characteristics, Maintenance Policy, Reliability and Availability Modeling, Reliability Evaluation Testing methods, Limits, Starvation, Coverage, Filtering, Microscopic Model of Software Risk.

UNIT II

Computation of software reliability, Functional and Operational Profile, Operational Profiles – Difficulties, Customer Type, User Type, System Mode, Test Selection - Selecting Operations, Regression Test.

UNIT III

Classes of software reliability Models, Time Dependent Software Reliability Models: Time between failure reliability Models, Fault Counting Reliability Models.

UNIT IV

Time Independent Software Reliability Models: Fault injection model of Software Reliability, Input Domain Reliability Model, Orthogonal defect classification, Software availability Models. Software Reliability Modeling: A general procedure for reliability modeling.

UNIT V

Short and Long Term Prediction, Model Accuracy, Analysing Predictive Accuracy – Outcomes, PLR, U and Y Plot, Errors and Inaccuracy, Recalibration – Detecting Bias, Different Techniques, Power of Recalibration, Limitations in Present Techniques, Improvements.

TEXT BOOKS:

1. J.D. Musa, *Software Reliability Engineering*, McGraw Hill, New York , 2004
2. H. Pham, *Software Reliability*, Springer Verlag, New York , 2000

REFERENCE BOOK:

1. Patric D. T.O Connor, *Practical Reliability Engineering, 4th Edition*, John Wesley & Sons , 2003
2. D. Reled, *Software Reliability Methods*, Springer Verlag, New York , 2001

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3E55

MOBILE COMPUTING
(ELECTIVE – 5)

UNIT I

Mobile Computing: Novel Applications, Limitations of Mobile Computing, **Mobile Computing Architecture**: Programming languages, Functions of Operating Systems, Functions of Middleware for mobile Systems, Mobile Computing Architectural layers, Protocols, Layers.

UNIT II

Mobile Devices: Handheld Mobile Smartphones with Multimedia Functionalities, Smartcards, Smart Sensors,**Mobile System Networks**: Cellular Network, WLAN Network and Mobile IP, Ad-hoc Networks, **Mobility Management**

UNIT III

Global System For Mobile Communications (Gsm): Mobile Services, System Architecture, Protocols, Localization & Calling, Handover, Security. **GPRS:** GPRS System Architecture, **UMTS**: UMTS System Architecture. **LTE**: Long Term Evolution

UNIT IV

Mobile Network Layer: Mobile IP: Goals, Assumptions, Entities and Terminology, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations, Dynamic Host Configuration Protocol (DHCP) **Mobile Transport Layer:** Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP, TCP over 2.5G/3G Wireless Networks.

UNIT V

Security Issues in Mobile Computing: Introduction, Information Security, Security Techniques and Algorithms, Security Protocols, Security Models, Security Frameworks for mobile Environment

TEXT BOOKS:

1. Raj Kamal, “Mobile Computing”, OXFORD UNIVERSITY PRESS.
2. Asoke K Talukder, et al, “Mobile Computing”, Tata McGraw Hill, 2008.

REFERENCES:

1. Jochen Schiller, “Mobile Communications”, Pearson Education, Second Edition, 2008.
2. Dr. Sunilkumar, et al “Wireless and Mobile Networks: Concepts and Protocols”, Wiley India.
3. Matthew S.Gast, “802.11 Wireless Networks”, SPD O’REILLY.
4. Ivan Stojmenovic , “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2007.

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3E56

BLOCKCHAIN TECHNOLOGY
(ELECTIVE-5)

Objectives:

- Familiarise the functional/operational aspects of cryptocurrency ECOSYSTEM.
- Understand Blockchain Technology Architecture and components.
- Smart Contracts and Bitcoins
- Understand Blcokchain and other technologies

UNIT I: Basics of Blockchain: Introduction, Concept of Blockchain, History, Definition of Blockchain, Fundamentals of Blockchain, Characteristics of Blockchain, Consensus in Trust-Building Exercise, Public, Private, and Hybrid Blockchains, Distributed Ledger Technologies, DLT Decentralized Applications and Databases, Architecture of Blockchain, Transactions, Chaining Blocks, Value Proposition of Blockchain Technology

UNIT II: Architecture of Blockchain: Architecture of Blockchain, Transactions, Chaining Blocks, Value Proposition of Blockchain Technology, **Consensus**: Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods

UNIT III: Blockchain Components: Introduction, Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Ethereum Key Pairs, Ethereum Addresses, Ethereum Wallets, Ethereum Transactions, Ethereum Languages, Ethereum Development Tools

UNIT IV: Smart Contracts: Introduction, Smart Contracts, Absolute and Immutable, Contractual Confidentiality, Law Implementation and Settlement, Characteristics, Internet of Things, **Bitcoins**: Introduction, Working of Bitcoin, Merkle Trees, Bitcoin Block Structure, Bitcoin Address, Bitcoin Transactions, Bitcoin Network, Bitcoin Wallets, Bitcoin Payments, Bitcoin Clients, Bitcoin Supply

UNIT V: Blockchain and Allied Technologies: Blockchain and Cloud Computing, Characteristics of Blockchain Cloud, Blockchain and Artificial Intelligence, Blockchain and IoT, Blockchain and Machine Learning, Blockchain and Robotic Process Automation

TEXTBOOKS:

1. Blockchain Technology: Concepts and Applications.Kumar Saurabh, Ashutosh Saxena,Wiley

REFERENCES:

1. Blockchain Technology,Chandramouli Subramanian, Asha A George, Abhilash K A and MeenaKarthikeyan,Universities Press
2. Blockchain Basics: A Non-Technical Introduction in 25 Steps by Daniel Drescher,Apress
3. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015 (article available for free download) { curtain raiser kind of generic article, written by seasoned experts and pioneers}.
4. J.A.Garay et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOl 9057, (VOLII), pp 281-310. (Also available at eprint.iacr.org/2016/1048) . (serious beginning of discussions related to formal models for bitcoin protocols).
5. R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017, (eprint.iacr.org/2016/454) . A significant progress and consolidation of several principles).
6. R.Pass et al, Fruitchain, a fair blockchain, PODC 2017 (eprint.iacr.org/2016/916).

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3O11

IMAGE PROCESSING AND PATTERN RECOGNITION
(OPEN ELECTIVE-1)

UNIT I

Fundamental steps of image processing, components of an image processing of system. The image model and image acquisition, sampling and quantization, relationship between pixels, distance functions, scanner.

UNIT II

Statistical and spatial operations, Intensity functions transformations, histogram processing, smoothing & sharpening – spatial filters Frequency domain filters, homomorphic filtering, image filtering & restoration. Inverse and weiner filtering, FIR weiner filter, Filtering using image transforms, smoothing splines and interpolation. Morphological and other area operations, basic morphological operations, opening and closing operations, dilation erosion, Hit or Miss transform, morphological algorithms, extension to grey scale images.

UNIT III

Segmentation and Edge detection region operations, basic edge detection, second order detection, crack edge detection, gradient operators, compass and laplace operators, edge linking and boundary detection, thresholding, regionbased segmentation, segmentation by morphological watersheds.Image compression: Types and requirements, statistical compression, spatial compression, contour coding, quantizing compression, image data compression-predictive technique, pixel coding, transfer coding theory, lossy and lossless predictive type coding, Digital Image Water marking.

UNIT IV

Representation and Description Chain codes, Ploygonal approximation, Signature Boundary Segments, Skeltons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, Principal components for Description, Relational Descriptors

UNIT V

Pattern Recognition Fundamentals: Basic Concepts of pattern recognition, Fundamental problems in pattern recognition system,design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model

Pattern classification: Pattern classification by distance function: Measures of similarity, Clustering criteria, K-means algorithm, Pattern classification by likelihood function: Pattern classification as a Statistical decision problem, Bayes classifier for normal patterns.

TEXT BOOKS :

1. Digital Image Processing Third edition, Pearson Education,Rafael C. Gonzalez, Richard E. Woods
2. Pattern recognition Principles: Julus T. Tou, and Rafel C. Gonzalez, Addision-Wesly Publishing Company

REFERENCES :

1. Image Processing, Analysis and Machine Vision, Second Edition, Milan Sonka, Vaclav Hlavac and Roger Boyle,Cengage learning.
2. Digital Image Processing,W.K.Pratt,4th editionJohn wiley&sons.
3. Fundamentals of digital image processing ,A.K. Jain,PHI
4. Pattern classification, Richard Duda, Hart and David strok John Weily publishers.
5. Digital Image Processing,S.Jayaraman,S.Esakkirajan,T.Veerakumar,TMH.
6. Pattern Recognition,R.Shinghal,Oxford University Press.
7. Digital Image Processing,S.Sridhar,Oxford University Press.

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3O12

SOFT COMPUTING
(OPEN ELECTIVE-1)

Objectives:

To give students knowledge of soft computing theories fundamentals, i.e. Fundamentals of artificial and neural networks, fuzzy sets and fuzzy logic and genetic algorithms.

UNIT I
AI Problems and Search: AI problems, Techniques, Problem Spaces and Search, Heuristic Search Techniques- Generate and Test, Hill Climbing, Best First Search Problem reduction, Constraint Satisfaction and Means End Analysis. Approaches to Knowledge Representation-Using Predicate Logic and Rules.

UNIT II
Artificial Neural Networks: Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back propagation Network. Associative Memory Networks. Traing Algorithms for pattern association, BAM and Hopfield Networks.

UNIT III
Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT IV
Introduction to Classical Sets (crisp Sets)and Fuzzy Sets- operations and Fuzzy sets. Classical Relations -and Fuzzy Relations- Cardinality, Operations, Properties and composition. Tolerance and equivalence relations.Membership functions- Features, Fuzzification, membership value assignments, Defuzzification.

UNIT V
Fuzzy Arithmetic and Fuzzy Measures, Fuzzy Rule Base and Approximate Reasoning Fuzzy Decision making Fuzzy Logic Control Systems, Genetic Algorithm- Introduction and basic operators and terminology. Applications: Optimization of TSP, Internet Search Technique.

TEXT BOOKS:

1. Principles of Soft Computing- S N Sivanandam, S N Deepa, Wiley India, 2007
2. Soft Computing and Intelligent System Design -Fakhreddine O Karray, Clarence D Silva,. Pearson Edition, 2004.

REFERENCE BOOKS:

1. Artificial Intelligence and SoftComputing- Behavioural and Cognitive Modeling of the Human Brain- Amit Konar, CRC press, Taylor and Francis Group.
2. Artificial Intelligence – Elaine Rich and Kevin Knight, TMH, 1991, rp2008.
3. Artificial Intelligence – Patric Henry Winston – Third Edition, Pearson Education.
4. A first course in Fuzzy Logic-Hung T Nguyen and Elbert A Walker, CRC. Press Taylor and Francis Group.

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3O13

BIOMETRICS
(OPEN ELECTIVE-1)

Objectives:
To learn the biometric technologies
To learn the computational methods involved in the biometric systems.
To learn methods for evaluation of the reliability and quality of the biometric systems.

UNIT I

Introduction & handwritten character recognition: Introduction – history – type of Biometrics – General Architecture of Biometric Systems – Basic Working of biometric Matching – Biometric System Error and performance Measures – Design of Biometric Systems – Applications of Biometrics – Benefits of Biometrics Versus Traditional Authentication Methods – character Recognition – System Overview – Geature Extraction for character Recognition – Neura; Network for handwritten Charater Recognition – Multilayer Neural Network for Handwritten Character Recognition – Devanagari Numeral Recognition – Isolated Handwritten Devanagari Charater Recognition suing Fourier Descriptor and Hidden markov Model.

UNIT II

Face biometrics & retina and iris biometrics: Introduction –Background of Face Recognition – Design of Face Recognition System – Neural Network for Face Recognition – Face Detection in Video Sequences – Challenges in Face Biometrices – Face Recognition Methods – Advantages and Disadvantages – Performance of Biometrics – Design of Retina Biometrics – Iris Segmentation Method – Determination of Iris Region – Experimental Results of Iris Localization – Applications of Iris Biometrics – Advantages and Disadvantages. VEIN AND FINGERPRINT BIOMETRICS & BIOMETRIC HAND GESTURE RECOGNITION FOR INDIAN SIGN LANGUAGE. Biometrics Using Vein Pattern of Palm – Fingerprint Biometrics – Fingerprint Recognition System – Minutiae Extraction – Fingerprint Indexing – Experimental Results – Advantages and Disadvantages – Basics of Hand Geometry – Sign Language – Indian Sign Language – SIFT Algorithms- Practical Approach Advantages and Disadvantages.

UNIT III

Privacy enhancement using biometrics & biometric cryptography and multimodal biometrics:

Introduction – Privacy Concerns Associated with Biometric Developments – Identity and Privacy – Privacy Concerns – Biometrics with Privacy Enhancement – Comparison of Various Biometrics in Terms of Privacy – Soft Biometrics - Introduction to Biometric Cryptography – General Purpose Cryptosystem – Modern Cryptography and Attacks – Symmetric Key Ciphers – Cryptographic Algorithms – Introduction to Multimodal Biometrics – Basic Architecture of Multimodal Biometrics – Multimodal Biometrics Using Face and Ear – Characteristics and Advantages of Multimodal Biometrics Characters – AADHAAR : An Application of Multimodal Biometrics.

UNIT IV

Watermarking techniques & biometrics : scope and future

Introduction – Data Hiding Methods – Basic Framework of Watermarking – Classification of Watermarking – Applications of Watermarking – Attacks on Watermarks – Performance Evaluation – Characteristics of Watermarks – General Watermarking Process – Image Watermarking Techniques – Watermarking Algorithm – Experimental Results – Effect of Attacks on Watermarking Techniques – Scope and Future Market of Biometrics – Biometric Technologies – Applications of Biometrics -Biometrics – and Information Technology Infrastructure – Role of Biometrics in Enterprise Security – Role of Biometrics in Border Security – Smart Card Technology and Biometric – Radio Frequency Identification Biometrics – DNA Biometrics – Comparative Study of Various Biometrics Techniques.

UNIT V

Image enhancement techniques & biometrics stands:

Introduction – current Research in image Enhancement Techniques – Image Enhancement – Frequency Domain Filters – Databases and Implementation – Standard Development Organizations – Application Programming Interface – Information Security and Biometric Standards – Biometric Template Interoperability.

TEXT BOOKS:

1. BIOMETRICS: CONCEPTS AND APPLICATIONS by G R SINHA and SANDEEP B. PATIL, Wiely, 2013.
2. Biometrics for Network Security – Paul Reid, Pearson Education.

REFERENCES:

1. Biometrics – Identity verification in a networked world – Samir Nanavathi, Micheal Thieme, Raj Nanavathi, Wiley – dream Tech.
2. Biometrics – The Ultimate Reference – John D. Woodward, Jr.Wiley Dreamtech.

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3O14

COMPUTER VISION
(OPEN ELECTIVE-1)

OBJECTIVES:

To review image processing techniques for computer vision
To understand shape and region analysis
To understand Hough Transform and its applications to detect lines, circles, ellipses
To understand three-dimensional image analysis techniques
To understand motion analysis
To study some applications of computer vision algorithms

UNIT I
IMAGE PROCESSING FOUNDATIONS Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

UNIT II
SHAPES AND REGIONS Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments

UNIT III
HOUGH TRANSFORM Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation

UNIT IV
3D VISION AND MOTION Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion

UNIT V
APPLICATIONS Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait

analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians

REFERENCES:

1. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2012.
2. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.
3. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.
4. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
5. D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012.
6. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3O15

CYBER SECURITY
(OPEN ELECTIVE-1)

Objectives:

To learn about cyber crimes and how they are planned
To learn the vulnerabilities of mobile and wireless devices
To learn about the crimes in mobile and wireless devices

UNIT I

Introduction to Cybercrime: Introduction, Cybercrime and Information security, who are cybercriminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT II

Cyber offenses: How criminals Plan Them Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT III

Cybercrime: Mobile and Wireless Devices: Introduction, 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, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

UNIT IV

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Passwaord Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks

UNIT V

Understanding Computer Forensics Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques,Forensics Auditing

TEXT BOOKS:

1. **Cyber Security**: *Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Nina Godbole and Sunil Belapure, Wiley INDIA.
2. **Introduction to Cyber Security** , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

REFERENCES

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

M.TECH (SOFTWARE ENGINEERING)
II YEAR I SEMESTER

SE3O16

NETWORK DESIGN
(OPEN ELECTIVE-1)

UNIT I

Switching technologies, multiplexing, circuit switching, packet switching X.25, frame relax, SMDs ATM, B-ISDN, traffic matrix, traffic pattern calculations, performance issues of packet networks, delay, availability and reliability

UNIT II

Network Design for Access: Campus network design, leased line and radio modems, DDR & ISDN Access Network design, X.25 remote access network design, Frame-relay interfaces & traffic shaping VSAT & WLAN network design. Scaling access networks.

UNIT III

Network Design for Backbone: Identification & selection of internetworking devices, CISCO routers & Nortel switches, EIGRP

UNIT IV

Network Design for convergence: UDP broadcasts, IP Networks for Voice, Data, Video, Fax, Soft & hard design examples for IP Technology networks, network design for digital video broadcast

UNIT V

Data Network Management Systems: Managing IP, ICMP, TCP, UDP, X.25 reporting Ethernet traffic, managing bridges & routers. Microsoft & HP, NMS Tools.
Case Studies: selected from design, architecture & topology areas of internetworks.

REFERENCE BOOKS

1. Data Network Design; D L Spolin, Mc-Graw Hill, 1993
2. SNMP "Feit" Mc-Graw Hill Inc., 1995
3. Network Design & Case Studies "CISCO Systems Inc." , CISCO Press, 1993