Institute Vision

To emerge as a Centre of Excellence for Learning and Research in the domains of engineering, computing and management.

Institute Mission

IM1: Provide congenial academic ambience with state -of -art of resources for learning and research.

IM2: Ignite the students to acquire self-reliance in the latest technologies.

IM3: Unleash and encourage the innate potential and creativity of students.

IM4: Inculcate confidence to face and experience new challenges.

IM5: Foster enterprising spirit among students.

IM6: Work collaboratively with technical Institutes / Universities / Industries of National and International repute

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR,
(Autonomous)

ACADEMIC REGULATIONS

(SITAMS - R20)

(M.Tech Regular-Full Time Two year degree program)

(For the batches admitted from the Academic Year 2020-2021)

(CHOISE BASED CREDIT SYSTEM)

1. ELIGIBILITY FOR ADMISSION

Admission of the M.Tech program shall be made subjects to the eligibility qualifications and Specialization prescribed by the University for each Program from time to time. Admission shall be made either on the basis of Merit/ Rank Obtained by the Qualifying candidates in PGCET or otherwise specified whichever is relevant.

2. AWARD OF M.Tech. DEGREE

A student will be declared eligible for the award of the M.Tech. Degree if he/she fulfils the following academic regulations:

Pursues a course of study for not less than two academic years and in not more than four academic years.

Registers for 68 credits and secure all 68 credits.

Semester	Course Particulars					Number of Credits
	Theory Courses	Practical Courses	MOOC / Open Elective	Audit Course	Project Work	
I-I	15	4	-	1	-	20
I-II	18	4	-	-	-	22
II-I	-	-	2	-	10	12
IV-I	-	-	-	-	14	14
Total Credits Allotted						**68**

3. ACADEMIC REQUIREMENTS

Students, who fail to fulfil all the academic requirements for the award of the degree within four academic years from the year of their admission, shall forfeit their seat in M.Tech. Course and their admission stands cancelled.

4. CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Engineering Science (ES), Professional Core (PC), Core Elective (CE), Open Elective (OE), Project Work (PW), and Mandatory Audit Course (MAC).

5. CONTACT PERIODS

Depending on the complexity and volume of the course, the number of contact hours per week will be assigned. Each Theory and Laboratory course carries credits based on the number of hours / week as follows.

- Contact classes (Theory): 1 credit per lecture hour per week.
- Laboratory Hours (Practical): 1 credit for 2 Practical hours, per week.
- Project Work: 1 credit for 2 hours of project work per week

6. SUPPLEMENTARY EXAMINATIONS

The student eligible to appear the supplementary external examinations if he was absent for it or failed in it or not registered.

7. DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in each semester shall be evaluated subject–wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition, project work shall be evaluated for100 marks.

- For theory subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examination.
- For practical subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End- Examination.

Internal Examinations

For theory subjects, during the semester, there shall be two mid-term examinations. Each mid-term examination consists of subjective paper for 30 marks with duration of 1hour 50 minutes. However 10 marks are awarded for a Technical Seminar presentation (Preferably case study topics on the particular course). Technical Seminar is presented from the students before term end examinations (preferably before practical examination) for every theory subjects.

Note 1: The theory subjective paper shall contain 3 questions of equal Weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 30 marks; any fraction shall be rounded off to the next higher mark.

Note 2: If the student is absent for the internal examination, no re-exam or make up shall be conducted and internal marks for that examination shall be considered as zero.

Note 3: First midterm examination shall be conducted for 50% of the syllabus and second midterm examination shall be conducted for the remaining 50% of the syllabus.

Note 4: Final Internal marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 20 Marks obtained in Second mid: 20

Internal Marks: (20x0.8) + (20x0.2) = 20

Final internal marks= Internal Marks+ Technical Seminar Presentation

Note 5: If the student is absent for any one midterm examination, the final internal marks shall be arrived at by considering 80% Weightage to the marks secured by the student in the appeared examination and zero to the other.

Note 6: For practical subjects there shall be a 40 sessional marks (20 marks allotted for one internal practical examination to be conducted before the last working day and 20 marks for Day-to- day work in the laboratory shall be evaluated by the concerned laboratory teacher based on the regularity / record / viva-voce) and end examination shall be for 60 marks.

End Examinations

End examinations (Theory courses)

End examination of theory subjects shall have the following pattern:

i. End examination shall be for 60 marks.
ii. There shall be either-or type questions for 12 marks each. Student shall answer any one of them.
iii. Each of these questions covers one unit of the syllabus.

End examinations (Practical courses)

End examination of practical course shall have the following pattern:

i. End examination shall be for 60 marks.
ii. The end examination shall be conducted by the concerned laboratory teacher and senior expert in the same subject of the department.

8. MASSIVE ONLINE OPEN COURSE'S (MOOC'S) AND OPEN ELECTIVE

i. The CBCS, also called as Open Electives (OEs) will be implemented in the college. The CBCS provides choice for students to select from the prescribed courses. In which students can take courses of their choice, learn at their own pace and adopt an interdisciplinary approach to learning.

ii. The college in line with the developments in Learning Management Systems (LMS) intends to encourage the students to do online courses in MOOCs, offered nationally / internationally. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self- learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion of the course from the MOOCs providers.

iii. Institution intends to encourage the students to do one MOOC in II year I Semester of the M.Tech. Programme. The respective departments shall give a list of standard MOOCs providers among NPTEL, edx, Udacity, Coursera, or any other standard providers, whose credentials are endorsed by the HoD. Each department shall appoint Coordinators / Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.

iv. A student shall choose an online open elective course, except his / her program of study from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.

v. Students may be permitted to register one online course (which is provided with certificate) in II year I semester and they should produce the course completion certificate of that course to the controller of Examination to become eligible for fulfillment of the degree before the end of II year II semester of their study.

vi. If, the student is unable to complete the certified MOOC within the stipulated period of time and if the candidate selected the MOOC has discontinued from the standard MOOC provider, the college has to conduct the equivalent examination (on the same MOOC syllabus) internally with the approval from the head of the department on the request of students along with separate examination fee.

9. CORE ELECTIVES

Students have to choose core electives (CE-I and CE-II) in I year I semester and core electives (CE-III and IV) in I year II semester, from the list of core electives courses given. However, the students may opt for core elective subjects offered in the related area.

10. PROJECT WORK

i. The project work for M.Tech. Programmes consist of Phase–I and Phase–II.

ii. The Phase–I is to be undertaken during II year I semester and Phase–II, which is a continuation of Phase–I is to be undertaken during II year II semester.

iii. If Candidates not completing Phase-I of project work successfully, the candidates can undertake Phase-I again in the subsequent semester. In such cases the candidates can enroll for Phase-II, only after successful completion of Phase-I.

iv. Project work shall be carried out under the supervision of a "senior teacher" in the Department. In this context "senior teacher" means the faculty member possessing (a) PG degree with a minimum of 5 years experience in teaching or (b) Ph.D. degree.

v. A candidate may, however, in certain cases, be permitted to work on projects in an Industrial/Research Organization, on the recommendations of the Head of the Department Concerned. In such cases, the Project work shall be jointly supervised by a supervisor of the department and an expert, as a joint supervisor from the organization and the student shall be instructed to meet the supervisor periodically and to attend the review committee meetings for evaluating the progress.

vi. The Project work (Phase II) shall be pursued for a minimum of 16 weeks during the final semester.

vii. The deadline for submission of final Project Report is 60 calendar days from the last working day of the semester in which project / thesis / dissertation is done. However, the Phase-I of the Project work shall be submitted within a maximum period of 30 calendar days from the last working day of the semester as per the academic calendar published by the Institution.

11. EVALUATION OF PROJECT WORK

- The evaluation of Project Work for Phase-I & Phase-II shall be done independently in the respective semesters and marks shall be allotted as per the weightages given in Clause 11.1.
- There shall be three internal assessments during the Semester by a review committee.
- The Student shall make presentation on the progress made before the Committee.
- The Head of the Department shall constitute the review committee.
- The total marks obtained in the three assessments shall be converted to 40 marks and rounded to the nearest integer (as per the Table given below).
- Project Work for Phase-I, there will be a Viva-voce Examination during End of the Semester conducted by a Committee consisting of the supervisor, two internal examiners (Preferably one Senior Teacher and Head of the Department).
- Project Work for Phase-II, there will be a Viva-voce Examination during End Semester Examinations conducted by a Committee consisting of the supervisor, one internal examiner and one external examiner.
- The internal examiner and the external examiner shall be appointed by the Principal / Chief Examiner.
- As per the guidelines given the project report must be prepared and submitted to the Head of the department before the Viva-Voce Examination.
- The distribution of marks for the internal assessment and End semester examination is given below:

11.1 Project-Work:

<table>
<tr><th colspan="7">Phase I</th></tr>
<tr><th colspan="3">Internal Assessment (40 Marks)</th><th colspan="4">End Semester Examination (60 Marks)</th></tr>
<tr><td rowspan="2">Review - I</td><td rowspan="2">Review - II</td><td rowspan="2">Review - III</td><td colspan="4">Project Work Phase I Viva – Voce
(60 Marks)</td></tr>
<tr><td>Thesis Submission (Project Review Committee)</td><td>Supervisor Examiner</td><td>Internal Examiner 1</td><td>Internal Examiner 2</td></tr>
<tr><td>10</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td></tr>
<tr><th colspan="7">Phase II</th></tr>
<tr><th colspan="3">Internal Assessment (40 Marks)</th><th colspan="4">End Semester Examination (60 Marks)</th></tr>
<tr><td rowspan="2">Review - I</td><td rowspan="2">Review - II</td><td rowspan="2">Review - III</td><td colspan="4">Project Work Phase II Viva – Voce
(60 Marks)</td></tr>
<tr><td>Thesis Submission (External Examiner)</td><td>Supervisor Examiner</td><td>Internal Examiner</td><td>External Examiner</td></tr>
<tr><td>10</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td></tr>
</table>

- In case of Industrial Project, Students are encouraged to go to Industrial Internship for at least 2-3 months and should be organized by the Head of the Department for every student.
- At the end of the Industrial Project, the candidate shall submit a certificate from the organization where he/she has undergone industrial training and also a brief report. The evaluation for 100 marks will be carried out internally based on this report and a Viva-Voce Examination will be conducted by a Departmental Committee constituted by the Head of the Institution.
- If the candidate fails to obtain 50% of the internal assessment marks in the Phase–I and Phase–II / final project viva-voce, he/she will not be permitted to submit the report for that particular semester and has to re-enroll for the same in the subsequent semester.

- At the end of the Phase – II Project Work, the candidate has to incorporate the plagiarism report in their thesis and it should be less than 30% (Excluding the references).
- The candidate has to publish at-least one research paper on their project topic in either Scopus indexed or Web of Science indexed journal (UGC listed journal) and details of the acceptance of the paper(s) / published paper(s) should be incorporated in the thesis.
- If a candidate fails to submit the project report on or before the specified deadline, he/she is deemed to have failed in the Project Work and shall re-enroll for the same in a subsequent semester. This applies to both Phase–I and Phase–II project work.
- If a candidate fails in the end semester examinations of Phase–I, he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. If he / she fails in the End semester examination of Phase–II of Project work, he/she shall resubmit the Project Report within 60 days from the date of declaration of the results. The resubmission of a project report and subsequent viva-voce examination will be considered as reappearance with payment of exam fee. For this purpose the same Internal and External examiners shall evaluate the resubmitted report.
- A copy of the approved Project Report after the successful completion of viva-voce examinations shall be kept in the library of the Institution.

12. ATTENDANCE REQUIREMENTS

- A student shall be eligible to appear for University examinations if he / she acquires minimum of 75% of attendance in aggregate of all the subjects in a semester.
- Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
- A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester when offered next.
- A stipulated fee shall be payable towards Condonation of shortage of attendance to the College.

13. COURSE PATTERN

- The entire course of study is for two academic years. All years shall be on semester pattern. A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination whenever it offered.
- When a student is detained due to shortage of attendance he may be re-admitted when the semester is offered after fulfillment of academic regulations. In such case, he / she shall be in the academic regulations into which he / she is readmitted.

14. WITH-HOLDING THE RESULT

- If the candidate has any dues not paid to the institution or if any case of indiscipline or malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

15. GRADING

- After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.
- Table – Conversion into Grades and Grade Points assigned

Range in which the Marks In the Subject Fall	**Grade**	**Grade Points** Assigned
≥ 90	S	10
80 ≥ 89	A	9
70 ≥ 79	B	8
60 ≥ 69	C	7
50 ≥ 59	D	6
< 50	F (Fail)	0
Absent	Abs (Absent)	0

- A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.
- For non credit courses "Pass" shall be indicated instead of the letter 'P' and this will not be counted for the computation of SGPA/CGPA.

16. SEMESTER GRADE POINT AVERAGE (SGPA) AND CUMULATIVE GRADE POINT AVERAGE (CGPA)

- The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$SGPA = \Sigma (Ci \times Gi) / \Sigma Ci$$

Where, Ci is the number of credits of the ith subject and Gi is the grade point scored by the student in the ith course.

- The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

  $CGPA = \Sigma (Ci \times Si) / \Sigma Ci$

  Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.
- Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- SGPA will be given to those who cleared all the subjects in that semester
- GRADE POINT: It is a numerical weight allotted to each letter grade on a 10-point scale.
- LETTER GRADE: It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D and F.

17. AWARD OF CLASS

- After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	**CGPA Secured**
First Class with Distinction	≥ 7.5
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$

18. TRANSITORY REGULATIONS

- Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfillment of academic regulations.

19. MINIMUM INSTRUCTION DAYS

- The minimum instruction days including exams for each semester shall be 90 days.

20. REVALUATION

- A candidate can apply for revaluation of his / her end examination answer paper in a theory courses. The examination section shall issue a notification inviting applications for the revaluation after publishing the results. The application forms can be obtained from the examination section. A candidate can apply for revaluation of answer scripts in not more than 5 subjects at a time.
- No revaluation for comprehensive Examination, practical and project work.

21. CONDUCT AND DISCIPLINE

i. Students shall conduct themselves within and outside the precincts of the Institute in a manner befitting the students of an Institute of National importance

ii. As per the order of the Hon'ble Supreme Court of India, ragging in any form is banned: acts of ragging will be considered as gross indiscipline and will be severely dealt with.

iii. The following additional acts of omission and /or commission by the students within or outside the precincts of the college shall constitute gross violation of code of conduct and are liable to invoke disciplinary measures

   a. Ragging
   b. Lack of courtesy and decorum: indecent behavior anywhere within or outside the campus.
   c. Willful damages or stealthy removal of any property /belongings of the Institute / Hostel or of fellow students
   d. Possession, consumption of distribution of alcoholic drinks or any kind of hallucinogenic drugs
   e. Mutilation or unauthorized possession of library books
   f. Hacking in computer systems
   g. Furnishing false statements to the disciplinary committee, or willfully withholding information relevant to an enquiry

h. Organizing or participation in any activity that has potential for driving fellow students along lines of religion caste batch of admission hostel or any other unhealthy criterion.
i. Resorting to noisy and unseemly behavior, disturbing studies of fellow students
j. Physical or mental harassment of fresher through physical contact or oral abuse
k. Adoption of unfair means in the examination
l. Organizing or participating in any group activity except purely academic and scientific Programmers in company with others in or outside campus without prior permission of the Principal
m. Disturbing in drunken state or otherwise an incident in academic or students function or any other public event.
n. Not obeying traffic rules in campus not following safety practices or causing potential danger to oneself or other persons in any way.
o. Any other act or gross indiscipline

iv. Commensurate with the gravity of the offence the punishment may be reprimand fine and expulsion from the hostel debarment from an examination rustication for a specified period or even outright expulsion from the College

v. The reprimanding Authority for an offence committed by students in the Hostel and in the Department or the classroom shall be respectively, the managers of the Hostels and the Head of the concerned Department

vi. In all the cases of offence committed by students in jurisdictions outside the purview of clause (21.v) the Principal shall be the Authority to reprimand them.

vii. All Major acts of indiscipline involving punishment other than mere reprimand shall be considered and decided by the Principal Students Disciplinary Committee appointed by the Principal.

viii. All other cases of Indiscipline of Students like adoption of unfair means in the examinations shall be reported to the Vice-Principal for taking appropriate action and deciding on the punishment to be levied.

ix. In all the cases of punishment levied on the students for any offence committed the aggrieved party shall have the right to appeal to the Principal who shall constitute appropriate Committees to review the case.

22. TRANSFER DETAILS

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh from time to time.

23. GENERAL

- The academic regulations should be read as a whole for purpose of any interpretation. Malpractices rules- nature and punishments are appended.
- Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
- The college may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the college.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR
(Autonomous)

M.Tech (R–– 2020) – Course Structure

I M.Tech. I Sem.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MCSE11	Program Core – I Mathematical foundations of Computer Science	PC	3	-	-	3	40	60	100
2.	20MCSE12	Program Core – II Advanced Data Structures and Algorithms	PC	3	-	-	3	40	60	100
3.	20MCSE13	Program Core – III Java and Web Technologies	PC	3	-	-	3	40	60	100
4.	20MMAC11	Research Methodology and IPR	MAC	2	-	-	1	40	60	100
5.	20MCSE14	Core Elective – I	CE	3	-	-	3	40	60	100
6.	20MCSE15	Core Elective - II	CE	3	-	-	3	40	60	100
7.	20MCSE16	Program Core Lab – I Advanced Data Structures and Algorithms Lab	PC	-	-	4	2	40	60	100
8.	20MCSE17	Program Core Lab – II Java and web Technologies Lab	PC	-	-	4	2	40	60	100
Contact Hours per week				17	-	8	-	-	-	-
Total Hours per week				25			-	-	-	-
Total credits							20	-	-	-
Total Marks								360	480	800

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR
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I M.Tech. II Sem.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MCSE21	Program Core – IV Data Warehousing and Mining	PC	3	-	-	3	40	60	100
2.	20MCSE22	Program Core – V Soft Computing	PC	3	-	-	3	40	60	100
3.	20MCSE23	Program Core – VI Big Data Analytics	PC	3	-	-	3	40	60	100
4.	20MCSE24	Program Core – VII Optimization Techniques	CE	3	-	-	3	40	60	100
5.	20MCSE25	Core Elective – III	CE	3	-	-	3	40	60	100
6.	20MCSE26	Core Elective - IV	CE	3	-	-	3	40	60	100
7.	20MCSE27	Program Core Lab – III Data Warehousing and Mining	PC	-	-	4	2	40	60	100
8.	20MCSE28	Program Core Lab – IV Big Data Analytics	PC	-	-	4	2	40	60	100
Contact Hours per week							-	-	-	-
Total Hours per week							-	-	-	-
Total credits							22	-	-	-
Total Marks								360	480	800

II M.Tech. I Sem.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	MOOC	Open Elective	OE	-	-	-	2	-	-	P
2.		Project Work (Phase-I) / Industrial Project*	PW	-	-	-	10	40	60	100
Contact Hours per week							-	-	-	-
Total Hours per week							-	-	-	-
Total credits							12	-	-	-
Total Marks								40	60	100

II M.Tech. II Sem.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.		Project Work (Phase-II) / Industrial Project*	PW	-	-	-	14	40	60	100
Contact Hours per week							-	-	-	-
Total Hours per week							-	-	-	-
Total credits							14	-	-	-
Total Marks								40	60	100

Students are encouraged to go to Industrial Internship for at least 2-3 months.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR
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I M.Tech. I Sem. (Core Elective – I)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MCSE14a	Advances in Databases	CE	3	-	-	3	40	60	100
2.	20MCSE14b	Artificial Intelligence	CE	3	-	-	3	40	60	100
3.	20MCSE14c	Advanced Software Engineering	CE	3	-	-	3	40	60	100
4.	20MCSE14d	Wireless Sensor Networks	CE	3	-	-	3	40	60	100

I M.Tech. I Sem. (Core Elective – II)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MCSE15a	Distributed Systems	CE	3	-	-	3	40	60	100
2.	20MCSE15b	Advanced Compiler Design	CE	3	-	-	3	40	60	100
3.	20MCSE15c	Machine Learning	CE	3	-	-	3	40	60	100
4.	20MCSE15d	Cloud Computing	CE	3	-	-	3	40	60	100

II M.Tech. I Sem. (Core Elective – III)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MCSE24a	Software Quality Assurance and Testing	CE	3	-	-	3	40	60	100
2.	20MCSE24b	Software Architecture and Design Patterns	CE	3	-	-	3	40	60	100
3.	20MCSE24c	Cryptography and Network Security	CE	3	-	-	3	40	60	100
4.	20MCSE24d	Distributed Databases	CE	3	-	-	3	40	60	100

II M.Tech. I Sem. (Core Elective – IV)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MCSE25a	Human and Computer Interaction	CE	3	-	-	3	40	60	100
2.	20MCSE25b	Computer Vision	CE	3	-	-	3	40	60	100
3.	20MCSE25c	Operations Research	CE	3	-	-	3	40	60	100
4.	20MCSE25d	Smart Sensors and Internet of Things	CE	3	-	-	3	40	60	100

II M.Tech. I Sem. (MOOC - Open Elective)

The college in line with the developments in Learning Management Systems (LMS) intends to encourage the students to do online courses in MOOCs, offered nationally / internationally. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion of the course from the MOOCs providers. Institution intends to encourage the students to do one MOOC in II year I Semester of the M.Tech. Programme. The respective departments shall give a list of standard MOOCs providers among NPTEL, edx, Udacity, Coursera, or any other standard providers, whose credentials are endorsed by the HoD. Each department shall appoint Coordinators / Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same. A student shall choose an online open elective course, except his / her program of study from the given list of MOOCS providers, as endorsed by the teacher concerned, with the approval of the HOD. Students may be permitted to register one online course (which is provided with certificate) in 2nd year 1st semester and they should produce the course completion certificate of that course to the controller of Examination to become eligible for fulfilment of the degree.

SUMMARY OF CREDIT ALLOCATION

S.NO	Subject Area	Credits As Per Semester				Total Credits	Percentage – wise Credit Distribution
		I-I	I-II	II-I	II-II		
1.	PC	13	16	-	-	29	42.65
2.	CE	6	6	-	-	12	17.65
3.	OE	-	-	2	-	2	3.00
4.	PW	-	-	10	14	24	35.30
5.	AC	1	-	-	-	1	1.50
Total		**20**	**22**	**12**	**14**	**68**	**100**

Note: PC – Professional Core; CE - Core Elective; OE - Open Elective; PW - Project Work; MAC – Mandatory Audit Course.

M. Tech (CSE) I – Semester

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Program Core – I

20MCSE11 Mathematical foundations of Computer Science

UNIT - I

Mathematical logic: Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT - II

Set theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions. Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Groups, Lattices as Partially Ordered Sets, Boolean algebra.

UNIT – III

Elementary Combinatory: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems, The Principle of Inclusion Exclusion.

UNIT – IV

Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of generating functions, Recurrence relations, Solving recurrence relations by substitution and Generating functions, The method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations.

UNIT - V

Graphs: Basic Concepts, Isomorphisms and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

Course Outcomes: After completion of course, students would be able to:

- Ability to apply mathematical logic to solve problems.
- Understand sets, relations, functions and discrete structures.
- Able to use logical notations to define and reason about fundamental mathematical Concepts such as sets relations and functions.
- Able to formulate problems and solve recurrence relations.
- Able to model and solve real world problems using graphs and trees.

Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay, R. Manohar, McGraw Hill education (India) Private Limited. (UNITS - I, II)
2. Discrete Mathematics for Computer Scientists & Mathematicians, Joe L. Mott, Abraham Kandel, Theodore P. Baker, Pearson , 2nd ed. (Units - III, IV, V)

Reference Books:

1. Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th Edition, McGraw Hill education (India) Private Limited.
2. Discrete Mathematics, D.S. Malik & M.K. Sen, Revised edition Cengage Learning.
3. Elements of Discrete Mathematics, C. L. Liu and D. P. Mohapatra, 4th edition, McGraw Hill education (India) Private Limited.
4. Discrete Mathematics with Applications, Thomas Koshy, Elsevier. 5. Discrete and Combinatorial Mathematics, R. P. Grimaldi, Pearson.

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M. Tech (CSE) I – Semester

L	P	C
3	0	3

Program Core -II

20MCSE12 Advanced Data Structures and Algorithms

UNIT - 1 : Overview of Data Structures and Algorithm Analysis

Review of arrays – Stacks - Queues - Linked lists - Linked stacks and linked queues – Applications - Efficiency of algorithms - Asymptotic notations - Time complexity of an algorithm using O notation - Polynomial Vs exponential algorithms - Average – Best - Worst case complexities - Analyzing recursive programs

UNIT - 2: Trees and Graphs - Binary search trees - AVL trees and B trees

Introduction - Definition and basic terminologies of trees and binary trees - Representation of trees and binary trees - Binary tree traversals - Threaded binary trees – Graphs basic concepts - representation of Graphs and Graphs traversals – Introduction of binary search tree - Binary search trees - Definition - Operations and applications - AVL trees - Definition - Operations and applications - B trees - Definition - Operations and applications

UNIT - 3: Red Black Trees - Divide and Conquer

Red black trees - Splay trees and its applications - Hash tables : Introduction - Hash tables - Hash functions and its applications General method of Divide and Conquer - Binary search - Finding maximum and minimum - Quick sort - Merge sort - Stassen's matrix multiplication

UNIT - 4: Greedy MethodandDynamic Programming

General method of Greedy method - Minimum cost spanning trees - Single source shortest path - General method of Dynamic programming - All pairs shortest path - Single source shortest path – 0 / 1 Knapsack problem - Reliability design - Traveling sales person's problem

UNIT - 5: Back Tracking - Branch and Bound

General method of Backtracking- 8 Queen's problem - Graph coloring - Branch and bound - The method - Control abstraction for LC search - Bounding - 0 / 1 Knapsack problem

Course Outcomes: By the end of the course, the students will be able to:

- Design and analyze programming problem statements.
- Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.
- Understand the necessary mathematical abstraction to solve problems.
- Come up with analysis of efficiency and proofs of correctness
- Comprehend and select algorithm design approaches in a problem specific manner.

Text Books:

1. "Data Structures and Algorithms", 1/e, 2009, G.A.V. Pai, TMH, Hyderabad, India.
2. "Fundamentals of Computer Algorithms", 2/e, 2008, Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, University Press, India.

Reference Books:

1. "Classic Data Structures", 2/e, 2009, D. Samanta, PHI, New Delhi, India.
2. "Design and Analysis of Computer Algorithms" , 1/e, 1998, Aho, Hopcraft, Ullman, PEA, New Delhi, India.
3. "Introduction to the Design and Analysis of Algorithms", 1/e, 1997, Goodman, Hedetniemi, TMG, Hyderabad, India.
4. "Design and Analysis of Algorithms", 3/e, 1977, E. Horowitz, S. Sahani , Galgotia, New Delhi,India.
5. "Data Structures and Algorithms in C++", 2/e, 2002, Drozdek, Thomson,Australia.

M. Tech (CSE) I – Semester

L	P	C
4	0	3

Program Core III

20MCSE13 Java and Web Technologies

UNIT - 1: HTML Common Tags and Java Scripts

List - Tables - Images - Forms - Frames - Cascading style sheets - Introduction to java scripts - Objects in java script - Dynamic HTML with java script

UNIT - 2: XML and Introduction to Swing

Document type definition - XML schemas - Document object model - Presenting XML - Using XML processors - DOM and SAX - Review of applets class - Event handling - AWT programming - JApplet - Handling swing controls like icon - Labels - Buttons - Textboxes – Combo boxes -Tabbed panes - Scroll panes - Trees - Tables - Differences between AWT controls & swing controls - Developing a home page using applet & swing

UNIT - 3: Java Beans - Web Servers and Introduction to Servelets

Introduction to java beans - Advantages of java beans - BDK introspection - Using bound properties - Beaninfo interface - Constrained properties - Persistence - Customizes - Java beans API - Tomcat server installation & testing - Lifecycle of a servlet - JSDK the servlet API - The javax.servelet package - Reading servlet parameters

UNIT - 4: More on Servlets

The javax.servelet.HTTP package - Handling http request & responses - Using cookies-session tracking - Security issues - Introduction to JSP - The problem with servlet - The anatomy of a JSP page - JSP processing - JSP application design with MVC architecture

UNIT - 5: JSP Application Development

Generating dynamic content - Using scripting elements - implicit JSP objects - Conditional processing - Displaying values using an expression to set an attribute - Declaring variables and methods error handling and debugging - Sharing data between JSP pages requests - Users passing control and date between pages - Sharing session and application data - Memory usage considerations - Accessing a database from a JSP page - Application specific database actions - Deploying JAVA beans in a JSP page.

Course Outcomes: By the end of the course, the students will be able to:

- Develop a dynamic webpage by the use of java script and DHTML.
- Write a well formed / valid XML document.
- Connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- Write a server side java application called Servlet to catch form data sent from client, process it and store it on database.

- Write a server side java application called JSP to catch form data sent from client and store it on database.

Text Books:

1. "Web Programming & building internet applications", 2/e, 2006, Chris Bates, Wiley Dreamtech (UNIT 1 ,2), New Delhi, India.
2. "The complete Reference Java 2", 5/e , 2002, Patrick Naughton and Herbert Schildt, TMH(UNIT 2 ,3), Hyderabad, India.
3. "Java Server Pages", 3/e, 2003, Hans Bergsten, SPD O'Reilly (UNITs 3 ,4 ,5), Hyderabad, India.

Reference Books:

1. "Programming world wide web", Pearson Core, Servlets and Java Server Pages Volume 1: Core Technologies, 7/e, 2012, Sebest, Marty Hall and Larry Brown Pearson, New Delhi,India.
2. "Web Technologies: A Computer Science Perspective", 1/e, 2006, Jeffrey C. Jackson, Pearson Education, New Delhi, India.
3. "Web Programming And Internet Technologies: An E-Commerce Approach", 1/e, 2012, Porter Scobey, PawanLingras, Jones and Bartlett Learning, Burlington, Usa.
4. "Web Application Architecture: Principles, Protocols and Practices", 2/e, 2009, Leon Shklar, Rich Rosen, Wiley Publications, New Delhi,India.
5. "Principles of Web Design: The Web Technologies Series", 5/e, 2011, Joel Sklar, Cengage Learning, New Delhi, India.

I M.Tech I Semester

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20MMAC11 RESEARCH METHODOLOGY AND IPR

Course Educational Objectives:

1. To provide knowledge on various types of research problems
2. To acquire knowledge on plagiarism and research ethics
3. To provide the fundamental knowledge on writing technical paper / presentation without violating professional ethics.
4. To introduce the fundamental aspects of intellectual property Rights to students who are going to play a major role in development of innovative projects in industries/societies.
5. To disseminate knowledge on copyrights and its related rights and registration aspects

UNIT – 1: RESEARCH PROBLEM FORMULATION (9)

Meaning of research problem – Sources of research problem – Criteria characteristics of a good research problem – Errors in selecting a research problem – Scope and objectives of research problem – Approaches of investigation of solutions for research problem, data collection, analysis, interpretation and necessary instrumentations.

UNIT – 2: LITERATURE REVIEW (9)

Effective literature studies approaches and analysis – Plagiarism information, software and analysis – Research ethics.

UNIT – 3: TECHNICALWRITING /PRESENTATION (9)

Effective technical writing – How to write the project report – How to write the technical paper/magazine – Developing a research proposal – Format of research proposal – A presentation and assessment by a review committee.

UNIT – 4: INTELLECTUAL PROPERTY RIGHTS (IPR) (9)

Nature of Intellectual Property: Patents – Designs – Trade and Copyright. **Process of Patenting and Development:** Technological research, innovation, patenting, development – Procedure for grants of patents, Patenting under PCT. **International Scenario:** International co-operation on intellectual property. **Patent Rights:** Scope of patent rights – Licensing and transfer of technology – Patent information and databases – Geographical indications. **New Developments in IPR:** Administration of patent system – IPR of biological systems, computer software, electronic system, mechanical and automotive system etc., Traditional knowledge case studies on IPR and IITs.

UNIT – 5: INTRODUCTION TO COPYRIGHTS (9)

Introduction to Copyrights: Principles of copyright – Technical/subject matters of copyright – Rights afforded by copyright law – Copyright ownership – Transfer and duration – Right to prepare derivative works – Rights of distribution – Rights of performers – Copyright formalities and registration – Limitations – Infringement of copyright – International copyright law – Protection Act.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand and analyze various types of Research Problems	**PO1, PO2**
CO2	Demonstrate knowledge on Plagiarism and Research ethics	**PO1, PO2, PO8**
CO3	Understand and analyze the basics of Research Proposals	**PO1, PO2, PO8**
CO4	Demonstrate knowledge on patent and PCT	**PO1, PO2, PO8**
CO5	Demonstrate knowledge on copyrights for their innovative works	**PO1, PO2, PO8**

Text Books:

1. Research Methodology: A Step by Step Guide for Beginners, Ranjit Kumar, 2/e, 2005, Pearson Education.
2. Resisting Intellectual Property, Debora J. Halbert, 2006, Taylor & Francis Ltd ,2007.

Reference books:

1. Research Methodology: An Introduction for Science & Engineering Students, Stuart Melville and Wayne Goddard, 2/e, 1996, Juta and Co Ltd.,
2. Research Methodology: Methods and Techniques, C.R. Kothari and Gaurav Garg, 4/e, 2019, New Age International Publishers, New Delhi.
3. Intellectual Property in the New Technological Age, 2016: Vol. I Perspectives, Trade Secrets and Patents, Peter S. Menell, Mark A. Lemley, and Robert P. Merges. 2016.
4. Intellectual Property in the New Technological Age, 2016: Vol. II Copyrights, Trademarks and State IP Protections, Peter S. Menell, Mark A. Lemley, and Robert P. Merges. 2016.
5. Intellectual Property Rights Law in India, T. Ramappa, 2/e, 2016, Asia Law House.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	2	-	-	-	-
CO3	3	2	-	-	-	-	-	2	-	-	-	-
CO4	3	2	-	-	-	-	-	3	-	-	-	-
CO5	3	2	-	-	-	-	-	3	-	-	-	-
CO*	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2.5**	**-**	**-**	**-**	**-**

M. Tech (CSE) I – Semester

L	P	C
3	0	3

Core Elective – I

20MCSE14a Advances in Databases

UNIT - 1: Databases and Database Users

Databases and database users - Database system concepts and architecture - Data models - Schemas and instances - DBMS architecture and data independence - Database languages and interfaces - Data modelling using the entity relationship model - ER model concepts – Entity relationship (ER) diagrams - Relational model concepts - Relational constraints - Functional dependencies and normalization for relational databases - Functional dependencies - Normal forms based on primary keys - General definitions of second and third normal forms - Boyce codd normal form (BCNF)

UNIT - 2: Relational Database Design Algorithms and Dependencies

Relational database design algorithms and further dependencies - Algorithms for relational database schema design - Multivalued dependencies and fourth normal form - Join dependencies and fifth normal form - Relational algebra – Additional relational operations - SQL a relational database language - The relational calculus QUEL - Domain relational calculus - QBE - Query processing and optimization - Basic algorithms for executing query operations - Using heuristics in query optimization - Using cost estimates in query optimization - Semantic query optimization - Transactions processing concepts - Transaction and system concepts - Desirable properties of transactions - Schedules and recoverability - Serializability of schedules

UNIT - 3: Concurrency Control and Recovery Techniques

Concurrency control techniques - Locking techniques for concurrency control - Concurrency control techniques based on timestamp ordering - Multiversion concurrency control techniques - Optimistic concurrency control techniques - Granularity of data items - Recovery techniques - Recovery concepts - Recovery techniques based on deferred update - Recovery techniques based on immediate update - Shadow paging - Database security and authorization - Introduction to database security issues - Discretionary access control using privileges

UNIT - 4: Advanced Data Modeling Concepts

Advanced data modeling concepts – Enhanced ER (EER) model concepts - EER-to-relational mapping - Data abstraction and knowledge representation concepts - Integrity constraints in data modeling – EER update operations and transaction specification - Overview of other data models - Object oriented databases – Overview of object oriented concepts - Object identity - Object structure and type constructors - Encapsulation of operations - Methods and persistence - Type and class hierarchies and inheritance - Complex objects - Other OO concepts - Examples of OODBMS - OO database design by EER-to-OO mapping

UNIT - 5: Parallel and Distributed Databases

Parallel databases - I/O parallelism – Inter query parallelism – Intra query parallelism – Intra operation parallelism - Interoperation parallelism - Design of parallel systems - Distributed databases – Homogeneous and Heterogeneous databases – Distributed data storage – Distributed Transactions – Commit protocols – Concurrency control in distributed databases – Availability – Distributed query processing – Heterogeneous distributed databases – Directory streams.

Text Books:

1. "Fundamentals of Database Systems", 4/e, 2004, RamezElmasri&Shamkant B. Navethe, Pearson Education, New Delhi, India.
2. "Database System Concepts", 5/e, 2006, Abraham Silberchatz, Henry F. Korth, S.Sudarsan, McGraw-Hill, Hyderabad, India.

Reference Books:

1. "Distributed Databases Principles and Systems", 1/e, 1985, Stefano Ceri, Giuseppe Pelagatti, McGraw-Hill International Editions, Hyderabad, India.
2. "Database Systems - A Practical Approach to Design Implementation and Management", 3/e, 2003, Thomas M. Connolly, Carolyn E. Begg, Pearson Education, New Delhi, India.
3. "A First Course in Database Systems", 3/e, 2007, Jefrey D. Ullman, Jenifer Widom, Pearson Education Asia, New Delhi, India.
4. "Object Oriented Interfaces and Databases", 1/e, 2004, Rajesh Narang, Prentice Hall, India .
5. "Advaced Database Systems", 1/e, 1997, Carlo Zaniolo, Stefano Ceri, ChiristosFaloutsos, Richard T. Snodgrass, V. S. Subrahmanian, Roberto Zicari, Morgan Kaufmann Publishers, Inc. San Francisco, California.

M. Tech (CSE) I – Semester

L	P	C
3	0	3

Core Elective – I

20MCSE14b Artificial Intelligence

UNIT – 1: Introduction to Artificial Intelligence, Problems, Problem Spaces and Search

The AI Problems - The underlying assumption - What is an AI technique? - The levels of the model - Criteria of success - Some general REFERENCES - One final word and beyond - Defining the problem as a State space search - Production systems - Problem characteristics - Production system characteristics - Issues in the design of search programs

UNIT – 2: Problem Solving, Un-informed Search Strategies, Informed Search and Exploration

Uninformed search strategies - Avoiding repeated states - Informed (Heuristic) search strategies - Heuristic functions - Local search algorithms and optimization problems - Local search in continuous spaces - Backtracking search for CSPs

UNIT – 3: Knowledge and Reasoning

Logical agents – Knowledge based agents - The wumpus world – Logic - Propositional logic - a very simple logic - Reasoning patterns in propositional logic - Effective propositional inference - Agents based on propositional logic

UNIT – 4: First-Order Logic, Inference in First-Order Logic, Knowledge Representation

Representation revisited - Syntax and semantic of first order logic - Using first order logic - Knowledge engineering in first order logic - Propositional vs. First order inference - Ontological engineering - Categories and objects - Actions, Situations and Events - The internet shopping world - Reasoning systems for categories - Reasoning with default information - Truth maintenance systems

UNIT – 5: Uncertain Knowledge and Reasoning, and Learning

Uncertainty - Acting under uncertainty - Basic probability notation - The axioms of probability - Inference using full joint distributions – Independence - Baye's rule and its use - Learning from observations - Forms of learning - Inductive learning - Learning decision trees - Ensemble Learning - Why Learning Works: Computational learning theory - Knowledge in Learning - A logical formulation of learning - Knowledge in learning

Text Books:

1. "Artificial Intelligence A Modern Approach", 2/e, 2003, Stuart Russell and Peter Norvig, Pearson Education, New Delhi, India.
2. "Artificial Intelligence", 3/e, 2004, Elaine Rich, Kevin Knight and Shiva Shankar B Nair, Tata McGraw Hill, Hyderabad, India.

Reference Books:

1. "Artificial Intelligence Structures and Strategies for Complex Problem Solving", 5/e, 2005, George F. Luther, Pearson Education, New Delhi, India.
2. "Introduction to Artificial Intelligence", 1/e, 1985, Eugene Charniak and Drew McDermott, Pearson Education, New Delhi, India.
3. "Artificial Intelligence: The Basics", 1/e, 2012, Kevin Warwick, Wearset ltd, Boldon.
4. "Introduction to Artificial Intelligence", 2/e, 1985, Philip C. Jackson, Dover Publications, New York, USA.

5. “Our Final Invention: Artificial Intelligence and the End of the Human Era”, 1/e, 2013, James Barrat, Thomas Dunne Books, New York, USA.

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3	0	3

Core Elective – I

20MCSE14c Advanced Software Engineering

UNIT - 1: Software - Software Engineering and Software Paradigms

The Nature of software - The Unique nature of webapps - Software engineering - The Software process - Software engineering practice - Software myths - Perspective process models - Specialized process models

UNIT - 2: Unified Process Model and Agile Development

The Unified process - Personal and team process models - Process technology - Product and process - What is agility - Agility and the Cost of change - What is an agile Process - Extreme programming (XP) - Other agile process models - A tool set for the agile process

UNIT - 3: Critical Systems specification and Formal Specification

A simple safety-critical system - System dependability - Availability and reliability - Safety - Security - Risk-driven specification - Safety specification - Security specification - Software reliability specification - Formal specification in the software process - Sub-system interface specification - Behavioral specification

UNIT - 4: Software Reuse - Component-based Software Engineering and Software Testing

The reuse landscape - Design patterns - Generator-based reuse - Application frameworks - Application system reuse - Components and component models - The CBSE process - Component composition - System testing - Component testing - Test case design - Test automation

UNIT - 5: Software Evolution - Aspect oriented software engineering and Service oriented software engineering

Program evolution dynamics - Software maintenance - Evolution processes - Legacy system evolution - The separation of concerns - Aspects - Join points and pointcuts - Software engineering with aspect - Services as reusable components – Sevice engineering-Software development with services

Text Books:

1. "Software Engineering", 8/e, 2006, Ian Sommerville ,Addison,Wesley , India.
2. **"**Software Engineering, A Practitioner's Approach", 7/e, 2009, Roger S. Pressman, TMH, Hyderabad, India.

Reference Books:

1. "Using UML: Software Engineering with Objects and Components", 2/e, 2006, Perdita Stevens, Rob Pooley, Addison Wesley, India.
2. "The Mythical Man-Month: Essays on Software Engineering ", 1/e, 1995, Frederick P, Jr. Brooks, Addison, Wesley, India.
3. "The Future of Software Engineering", 1/e, 2000, Anthony Finkelstein, ACM Press, New York.

4. "Aspect-Oriented Software Development", 1/e, 2004, Robert E. Filman ,TzillaElrad , Siobhan Clarke , Mehmet Aksit , Addison Wesley, India.
5. "Service-Oriented Software System Engineering: Challenges and Practices", 1/e, 2005, ZoranStojanovic , AjanthaDahanayake , IGI Global, USA.
5. "Software Reuse", 1/e, 1997, I. Jacobson M. Griss and P. Jonsson ,ACM Press, New York.

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M. Tech (CSE) I – Semester

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3	0	3

Core Elective – I

20MCSE14d **Wireless Sensor Networks**

UNIT 1:
Introduction to Wireless Sensor Networks: Course Information, Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, History and Design factors Network Architecture: Traditional layered stack, Cross-layer designs, Sensor Network Architecture Hardware Platforms: Motes, Hardware parameters

UNIT 2:
Introduction to ns-3: Introduction to Network Simulator 3 (ns-3), Description of the ns-3 core module and simulation example.

UNIT 3:
Medium Access Control Protocol design: Fixed Access, Random Access, WSN protocols: synchronized, duty-cycled Introduction to Markov Chain: Discrete time Markov Chain definition, properties, classification and analysis MAC Protocol Analysis: Asynchronous duty-cycled. X-MAC Analysis(Markov Chain)

UNIT 4:
Security: Possible attacks, countermeasures, SPINS, Static and dynamic key distribution

UNIT 5:
Routing protocols: Introduction, MANET protocols Routing protocols for WSN: Resource-aware routing, Data-centric, Geographic Routing, Broadcast, Multicast Opportunistic Routing Analysis: Analysis of opportunistic routing (Markov Chain) Advanced topics in wireless sensor networks.

COURSE OUTCOMES

After completion of course, students would be able to:

1. Describe and explain radio standards and communication protocols for wireless sensor networks.
2. Explain the function of the node architecture and use of sensors for various applications.
3. Be familiar with architectures, functions and performance of wireless sensor networks systems and platforms.

REFERENCES:

1. W. Dargie and C. Poellabauer, “Fundamentals of Wireless Sensor Networks –Theory and Practice”, Wiley 2010
2. KazemSohraby, Daniel Minoli and TaiebZnati, “wireless sensor networks -Technology, Protocols, and Applications”, Wiley Interscience 2007
3. Takahiro Hara,Vladimir I. Zadorozhny, and Erik Buchmann, “Wireless Sensor Network Technologies for the Information Explosion Era”, springer 2010

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3	0	3

Core Elective – II

20MCSE15a **Distributed Systems**

UNIT 1: INTRODUCTION
Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts.
DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE: Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues

UNIT 2: DISTRIBUTED DATABASE DESIGN
Alternative design strategies; Distributed design issues; Fragmentation; Data allocation. **SEMANTICS DATA CONTROL:** View management; Data security; Semantic Integrity Control. **QUERY PROCESSING ISSUES:** Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data

UNIT 3: DISTRIBUTED QUERY OPTIMIZATION
Factors governing query optimization; Centralized query optimization; ordering of fragment queries; Distributed query optimization algorithms. **TRANSACTION MANAGEMENT:** The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models. **CONCURRENCY CONTROL:** Concurrency control in centralized database systems; Concurrency control in DDBSs;Distributed concurrency control algorithms; Deadlock management

UNIT 4: RELIABILITY
Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols

UNIT 5: PARALLEL DATABASE SYSTEMS
Parallel architectures; parallel query processing and optimization; load balancing

COURSE OUTCOMES
After completion of course, students would be:

- Design trends in distributed systems.
- Apply network virtualization.
- Apply remote method invocation and objects.

REFERENCES:

1. Principles of Distributed Database Systems, M.T. Ozsu and P. Valduriez, Prentice-Hall, 1991.
2. Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley, 1992.

M. Tech (CSE) I – Semester

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3	0	3

Core Elective – II

20MCSE15b **Advanced Compiler Design**

UNIT – 1: Introduction Formal Language and Regular Expressions

Languages - Definition languages - Regular expressions - Finite automata - DFA - NFA - Conversion of regular expression to NFA - NFA to DFA - Overview of compilation - Phases of compilation - Lexical analysis - Pass and phases of translation - Interpretation - Bootstrapping - Data structures in compilation - LEX lexical analyzer generator

UNIT – 2: Top Down Parsing

Context free grammars - Derivation - Parse trees - Ambiguity grammars top down parsing - Top down parsing - Backtracking - LL (1) - Recursive descent parsing - Predictive parsing and preprocessing steps required for predictive parsing

UNIT – 3: Bottom up parsing

Shift reduce parsing - LR and LALR parsing - Error recovery in parsing - Handling ambiguous grammar - YACC - Automatic parser generator

UNIT – 4: Semantic Analysis and Storage Allocation

Syntax directed translation - S-attributed and L-attributed grammars - Type checker - Intermediate code - Abstract syntax tree - Polish notation and three address codes - Translation of simple statements and control flow statements run time storage - Storage organization - Storage allocation strategies scope *access* to non local names - Parameters - Language facilities for dynamics storage allocation.

UNIT – 5: Code Optimization and Object Code Generation

Consideration for optimization - Scope of optimization - Local optimization - Loop optimization - Frequency reduction - Folding - DAG representation - Machine dependent code generation - Object code forms - Generic code generation algorithm - Register allocation and assignment - Using DAG representation of block.

Text Books:

1. “Introduction to Theory of computation”, 3/e, 2012, Sipser, Thomson, Australia.
2. “Compilers Principles Techniques and Tools”, 1/e, 1986, Aho, Ullman, Ravisethi, Pearson Education, New Delhi, India.

Reference Books:

1. “Modern Compiler Construction in C”, 1/e, 2004, Andrew W.Appel, Cambridge University Press, London.
2. “Compiler Construction”, 1/e, 1997, Louden, Thomson, Australia.
3. “Compiler Design: Analysis and Transformation”, 1/e, 2012, Reinhard Wilhelm, Helmut Seidl, Sebastian Hack, Springer, New York, Usa.
4. “Advanced Compiler Design and Implementation”, 1/e, 1997, Muchnick, Steven, Morgan Kaufmann, San Francisco, USA.
5. “The Compiler Design Handbook: Optimizations & Machine Code”, 1/e, 2002, Y.N. Srikant, Priti Shankar, CRC Press, Boca Raton, USA.

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3	0	3

Core Elective – II

20MCSE15c **Machine Learning**

UNIT 1:

Supervised Learning (Regression/Classification). Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Na ve Bayes. Linear models: Linear Regression, Logistic Regression, Generalized Linear Models. Support Vector Machines, Nonlinearity and Kernel Methods. Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

UNIT 2:

Unsupervised Learning: Clustering: K-means/Kernel K-means. Dimensionality Reduction: PCA and kernel PCA Matrix Factorization and Matrix Completion. Generative Models (mixture models and latent factor models)

UNIT 3:

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

UNIT 4:

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

UNIT 5:

Scalable Machine Learning (Online and Distributed Learning), A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference

COURSE OUTCOMES

After completion of course, students would be able to:

- Extract features that can be used for a particular machine learning approach in various IOT
- applications.
- To compare and contrast pros and cons of various machine learning techniques and to get
- an insight of when to apply a particular machine learning approach.
- To mathematically analyse various machine learning approaches and paradigms.

REFERENCES:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
4. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

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Core Elective – II

20MCSE15d **Cloud Computing**

UNIT 1:
Introduction to Cloud Computing. Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing

UNIT 2:
Cloud Computing Architecture. Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model Cloud Deployment Models
Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise

UNIT 3:
Security Issues in Cloud Computing Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security Identity and Access Management Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management

UNIT 4:
Security Management in the Cloud Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS Privacy Issues Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations

UNIT 5:
Audit and Compliance Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud

COURSE OUTCOMES
After completion of course, students would be able to:
- Identify security aspects of each cloud model
- Develop a risk-management strategy for moving to the Cloud
- Implement a public cloud instance using a public cloud service provider
- Apply trust-based security model to different layer

REFERENCES:
1. Cloud Computing Explained: Implementation Handbook for Enterprises, John Rhoton, Publication Date: November 2, 2009
2. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice), Tim Mather, ISBN-10: 0596802765,O'Reilly Media, September 2009

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Program Core Lab – I

20MCSE16 Advanced Data Structures and Algorithms Lab

LAB EXERCISES:

Exercises should be designed to cover the following topics:

Implementation of graph search algorithms.

- Implementation and application of network flow and linear programming problems.
- Implementation of algorithms using the hill climbing and dynamic programming design techniques.
- Implementation of recursive backtracking algorithms.
- Implementation of randomized algorithms.
- Implementation of various locking and synchronization mechanisms for concurrent linked lists, concurrent queues, and concurrent stacks.
- Developing applications involving concurrency.

OUTCOMES:

Upon completion of the course, the students will be able to

- Design and apply iterative and recursive algorithms.
- Design and implement algorithms using the hill climbing and dynamic programming and recursive backtracking techniques.
- Design and implement optimisation algorithms for specific applications.
- Design and implement randomized algorithms.
- Design appropriate shared objects and concurrent objects for applications.
- Implement and apply concurrent linked lists, stacks, and queues.

REFERENCES:

1. Jeff Edmonds, “How to Think about Algorithms”, Cambridge University Press, 2008.
2. M. Herlihy and N. Shavit, “The Art of Multiprocessor Programming”, Morgan Kaufmann, 2008.
3. Steven S. Skiena, “The Algorithm Design Manual”, Springer, 2008.
4. Peter Brass, “Advanced Data Structures”, Cambridge University Press, 2008.
5. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, “Algorithms” , McGrawHill, 2008.
6. J. Kleinberg and E. Tardos, "Algorithm Design“, Pearson Education, 2006.
7. T. H. Cormen, C.2 E. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms“, PHI Learning Private Limited, 2012.
8. Rajeev Motwani and Prabhakar Raghavan, “Randomized Algorithms”, Cambridge University Press, 1995.
9. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, “The Design and Analysis of Computer Algorithms”, Addison-Wesley, 1975.
10. A. V. Aho, J. E. Hopcroft, and J. D. Ullman,”Data Structures and Algorithms”, Pearson,2006.

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Program Core Lab – II

20MCSE17 **Java and web Technologies Lab**

LIST OF EXPERIMENTS:

1. Java classes and objects
2. Inheritance, Polymorphism
3. Interfaces and Exception Handling, Packages
4. Using InetAddress class
5. Socket Programming in Java
6. RMI
7. Client side scripting using
    - XHTML,
    - Javascript/DOM
    - CSS 8. XML DTD, Parsers, XSLT
9. Programming with AJAX, JQuery
10. Java Applets, AWT, Swings
11. Server Side programming (implement these modules using any of the server side scripting languages like PHP, Servlets, JSP etc.,
    - Gathering form data
    - Querying the database
    - Response generation
    - Session management
12. MySQL/JDBC/Oracle
13. Application development
14. Develop applications using Dreamweaver/Flex/SilverLight etc.,

Course Outcomes:

Upon Completion of the course, the students will be able to:

- learn the Internet Programming
- Design simple web pages using markup languages like HTML and XHTML.
- Create dynamic web pages using DHTML and java script that is easy to navigate and use.
- Program server side web pages that have to process request from client side web pages.
- Represent web data using XML and develop web pages using JSP.
- Understand various web services and how these web services interact.

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Program Core – IV

20MCSE21 Data Warehousing and Mining

UNIT - 1: Introduction

Data Mining: Kinds of data - Data mining functionalities - Classification of data mining systems - primitives - Major issues in data mining.

Data Preprocessing: Descriptive data summarization - Data cleaning - Data integration and transformation - Data reduction - Data discretization and concept hierarchy generation

UNIT - 2: DW, OLAP Technology and Mining Frequent and Associations

Data Warehouse and OLAP Technology: What is data warehouse - A multidimensional data model - Data warehouse architecture - Data warehouse implementation from data warehouse to data mining.

Mining Frequent Patterns and Associations: Basic concepts - Efficient and scalable frequent itemset mining methods - Mining various kinds of association rules

UNIT - 3: Classification and Prediction

Issues regarding classification and prediction - Classification by decision tree induction - Bayesian classification - Rule based classification - Prediction - Accuracy and error measures

UNIT - 4: Cluster Analysis

Introduction – Similarity and distance measures – Outliers – Hierarchical algorithms – Partitional algorithms – clustering large databases – clustering with categorical attributes

UNIT - 5: Applications and Trends in Data Mining

Data mining applications - Data mining for financial data analysis - Data mining for the retail industry - Data mining for the telecommunication industry - Data mining for biological data analysis - Data mining in other scientific applications - Data mining for intrusion detection - Social impacts of data mining

Text Books:

1. "Data Mining, Concepts and Techniques", 2/e, 2008, Jiawei Han and MichelineKamber, Elsevier, India.
2. "Data Mining Introductory and Advanced Topics", 2/e, 2006, Margaret H Dunham, Pearson Education, New Delhi, India. (UNIT-4)

Reference Books:

1. "Data Warehousing", 4/e, 2007, AmiteshSinha, Thomson Learning, India.
2. "Data Mining Techniques", 1/e, 2001, ARUN K PUJARI, University Press, Hyderabad, India.
3. "Data Warehousing in the Real World", 1/e, 2009, SAM ANAHORY & DENNIS MURRAY. Pearson Education, New Delhi, India.
4. "Data Warehousing Fundamentals", 2/e, 2001, PaulrajPonnaiah, Wiley student edition, New Delhi, India.
5. "The Data Warehouse Life cycle Tool kit", 2/e, 2008, RALPH KIMBALL, Wiley Student Edition, USA.

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Program Core – V

20MCSE22 **Soft Computing**

UNIT 1 : INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

UNIT 2 : FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT 3 : NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

UNIT 4 : GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.

UNIT 5 : Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

COURSE OUTCOMES

After completion of course, students would be able to:

- Identify and describe soft computing techniques and their roles in building intelligent
- machines
- Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering
- problems.
- Apply genetic algorithms to combinatorial optimization problems.
- Evaluate and compare solutions by various soft computing approaches for a given problem.

REFERENCES

1. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing, Prentice:Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications, Prentice Hall, 1995.
3. MATLAB Toolkit Manual

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Program Core – VI

20MCSE23 **Big Data Analytics**

UNIT 1:
What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

UNIT 2:
Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer to peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.

UNIT 3:
Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures

UNIT 4:
MapReduce workflows, UNIT tests with MRUNIT, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats

UNIT 5:
Hbase, data model and implementations, Hbase clients, Hbase examples, praxis.Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration.

COURSE OUTCOMES
After completion of course, students would be:

- Describe big data and use cases from selected business domains
- Explain NoSQL big data management
- Install, configure, and run Hadoop and HDFS
- Perform map-reduce analytics using Hadoop
- Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

REFERENCES:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging
2. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
3. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of
4. Polyglot Persistence", Addison-Wesley Professional, 2012.

5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
6. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
7. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
8. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
9. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
10. Alan Gates, "Programming Pig", O'Reilley, 2011.

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Program Core – VII

20MCSE24 **Optimization Techniques**

UNIT – 1

Decision Making procedure under certainty and under un certainty – Operations Research – Probability and decision – making – Queuing or Waiting line theory – Simulation and Monte - Carlo Technique – Nature and organization of optimization problems – Scope and hierarchy of optimization – Typical applications of optimization.

UNIT – 2

Essential features of optimization problems – Objective function – Continuous functions – Discrete functions – Unimodal functions – Convex and concave functions, Investment costs and operating costs in objective function – Optimizing profitably constraints – Internal and external constraints – Formulation of optimization problems. Continuous functions – Discrete functions. Unimodal functions – Convex and concave functions

UNIT – 3

Necessary and sufficient conditions for optimum of unconstrained functions – Numerical methods for unconstrained functions – One-dimentional search – Gradient – free search with fixed step size. Linear programming - Graphical interpretation-Simplex method – Apparent difficulties in th Simplex method.

UNIT – 4

Transportation Problem, Loops in transportation table, Methods of finding initial basic feasible solution, Tests for optimality. Assignment Problem, Mathematical form of assignment problem, methods of solution.

UNIT – 5

Network analysis by linear programming and shortest route, maximal flow problem. Introduction to Non-traditional optimization, Computational Complexity – NP-Hard, NP-Complete. Tabu Search-Basic Tabu search, Neighbourhood, Candidate list, Short term and Long term memory.

Course Outcomes:

- Formulate mathematical models for optimization problems.
- Analyze the complexity of solutions to an optimization problem.
- Design programs using meta-heuristic search concepts to solve optimizations problems.
- Develop hybrid models to solve an optimization problem

Text Books:

1. Rao S.S., Optimization Theory and Applications, Wiley Eastern.
2. Hamdy A. Taha, Operations Research – An introduction, Prentice – Hall India.
3. G. Zapfel, R. Barune and M.Bogl, Meta heuristic search concepts: A tutorial with applications to production and logistics, Springer.

References:

1. Gass S.I., Introduction to Linear Programming, Tata McGraw Hill.
2. Reeves C., Modern heuristics techniques for combinatorial problems, Orient Longman.
3. Goldberg, Genetic algorithms in Search, optimization and Machine Learning, Addison Wesley.
4. K.Deb, Optimization for engineering design algorithms and examples, Prentice Hall of India

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Core Elective – III

20MCSE25a **Software Quality Assurance and Testing**

UNIT - 1: Introduction
What is Quality? Software quality assurance - Components of software quality assurance - Steps to develop and implement a Software Quality Assurance Plan
Quality Standards: ISO 9000 and Companion ISO Standards - CMM - CMMI - PCMM - MalcomBal ridge - 3 Sigma - 6 Sigma

UNIT - 2: Software Quality Assurance Metrics and Measurement
Product quality metrics - In-Process quality metrics - Metrics for software maintenance - Examples of metric programs

UNIT - 3: Software Quality Metrics Methodology and Software Quality Indicators
Establish quality requirements - Identify software quality metrics - Implement the software quality metrics - Analyze software metrics results - Validate the software quality metrics
Software Quality Indicators: Fundamentals in measurement theory
Software Testing Strategy and Environment: Establishing testing policy - Structured approach to testing - Test factors - Economics of System Development Life Cycle (SDLC) Testing

UNIT - 4: Software Testing Tools and Testing Process Eleven Step Testing Process
Taxonomy of testing tools - Methodology to evaluate automated testing tools - Load Runner - Win runner and Rational Testing Tools - Silk test - Java Testing Tools - JMetra - JUNIT and Cactus
Testing Process Eleven Step Testing Process: Assess project management development estimate and status - Develop test plan - Requirements phase testing - Design phase testing - Program phase testing - Execute test and record results - Acceptance test - Report test results - Testing software installation - Test software changes - Evaluate test effectiveness

UNIT - 5: Software Testing Methodology and Techniques
Defects hard to find - Verification and validation - Functional and structural testing - Workbench concept - Eight considerations in developing testing methodologies - Testing tactics checklist
Software Testing Techniques:
Black-Box - Boundary value - Bottom-up - Branch coverage – Cause effect graphing - CRUD - Database - Exception - Gray-Box - Histograms - Inspections - JADs - Pareto analysis - Prototyping - Random testing - Risk-based testing - Regression testing - Structured walkthroughs - Thread testing - Performance testing – White Box testing

Text Books:
1. Effective Methods for Software Testing, 2/e, 2006, William E. Perry, Wiley India.
2. Software Quality, 2/e, 2002, Mordechai Ben-Menachem/Garry S. Marliss, Thomson Learning publication, India.

Reference Books:

1. Testing and Quality Assurance for Component-based Software, 1/e, 2003, Gao, Tsao and Wu, Artech House Publishers, India.
2. Software Testing Techniques, 2/e, 1990, BoriesBeizer, Dreamtech Press, India.
3. Managing the Testing Process, 2/e, 2002, Rex Black, Wiley, India.
4. Handbook of Software Quality Assurance, 2/e, 2003, G. Gordon Schulmeyer, James I.McManus, International Thomson Computer Press, Europe.
5. Software Testing and Continuous Quality Improvement, 2/e, 2004, William E.Lewis, GunasekaranVeerapillai, Auerbach Publications, New Yark.
6. Metrics and Models for Software Quality Engineering, 2/e, 2006, by Stephen H. Kan, Pearson Education Publication, New Delhi, India.
7. Software Testing Tools, 3/e, 2003, K.V.K.K. Prasad, Dream tech press, India.
8. Practical Software Testing, 2/e, 2005, Ilene Burnstein, Springer, India.
9. Software Testing, 2/e, 2006, SrinivasanDesikan&Gopalaswamy Ramesh, Pearson Education, New Delhi, India.
10. Software Testing Techniques, 2/e, 1990, Scott Loveland & Geoffrey Miller, Shroff Publishers, Delhi, India.
11. Software Quality, 1/e, 2001, Martin Wieczorek& Dirk Meyerhoff, Springer, India.

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Core Elective – III

20MCSE25b **Software Architecture and Design Patterns**

Unit – 1:
Introduction: what is a design pattern? describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. What is object-oriented development? , key concepts of object oriented design other related concepts, benefits and drawbacks of the paradigm

Unit – 2:
Analysis a System: overview of the analysis phase, stage 1: gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain. Design and Implementation, discussions and further reading.

Unit – 3:
Design Pattern Catalog: Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy.

Unit – 4:
Interactive systems and the MVC architecture: Introduction , The MVC architectural pattern, analyzing a simple drawing program , designing the system, designing of the subsystems, getting into implementation , implementing undo operation , drawing incomplete items, adding a new feature , pattern based solutions.

Unit – 5:
Designing with Distributed Objects: Client server system, java remote method invocation, implementing an object oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays.

Course outcomes:
The students should be able to:
Design and implement codes with higher performance and lower complexity

- Be aware of code qualities needed to keep code flexible
- Experience core design principles and be able to assess the quality of a design
- with respect to these principles. Capable of applying these principles in the design of object oriented systems.
- Demonstrate an understanding of a range of design patterns. Be capable of
- comprehending a design presented using this vocabulary.

Text Books:
1. Object-oriented analysis, design and implementation, brahma dathan, sarnath rammath, universities press,2013
2. Design patterns, erich gamma, Richard helan, Ralph johman , john vlissides ,PEARSON Publication,2013.

Reference Books:
1. Frank Bachmann, RegineMeunier, Hans Rohnert “Patter n Oriented Software

Architecture" –Volume 1, 1996.
2. William J Brown et al., "Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis", John Wiley, 1998.

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Core Elective – III

20MCSE25c **Cryptography and Network Security**

UNIT - 1: Introduction and Modern Techniques
Attacks - Services and mechanisms - Security attacks - Security services - A Model for network security - Classical encryption techniques - Symmetric cipher model – Substitution techniques – Transposition techniques – Rotor machines – Steganography.
Modern Techniques: Simplified DES - Block cipher principles - Data Encryption Standard - Strength of DES - Differential and linear cryptanalysis - Block Cipher Design Principles

UNIT - 2: Conventional Encryption and Public Key Cryptography and Hash and Mac Algorithms
Confidentiality Using Symmetric Encryption: Placement of encryption function - Traffic confidentiality - Key distribution - Random Number Generation
Public Key Cryptography: Principles - RSA Algorithm - Key management - Diffie-Hellman key exchange
Hash and Mac Algorithms: Secure hash algorithm – Whirlpool – HMAC - CMAC

UNIT - 3: Digital signatures, Authentication protocols and Authentication Applications
Digital signatures - Authentication protocols - Digital signature standard
Authentication Applications: Kerberos - X.509 Authentication service – Public key infrastructure

UNIT - 4: Electronic Mail Security and IP Security
Electronic Mail Security: Pretty Good Privacy - S/MIME
IP Security: Overview - Architecture – Authentication header - Encapsulating security Payload - Combining security associations - Key management

UNIT - 5: Web Security and Intruders
Web Security Considerations - Secure socket layer and transport layer security - Secure Electronic Transaction
Intruders: Intruders - Intrusion detection - Password management – Firewalls - Firewall design principles - Trusted systems

Text Books:

1. "Cryptography and Network Security", 4/e, 2006, William Stallings , Pearson Education, New Delhi, India.
2. "Network Security Essentials (Applications and Standards)", 3/e, 2007,William Stallings, Pearson Education, New Delhi, India.

Reference Books:

1. "Security in Computing", 4/e, 2009, Charles P. Pfleeger, Shari Lawrence Pfleeger, Deven Shah, Pearson Education, New Delhi, India.
2. "Principles and Practices of Information Security", 4/e, 2012, Michal E. Whitman and Herbert J. Mattord, Cengage Learning, New Delhi.

3. "Hack Proofing your network", 2/e, 2002, Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn IdoDubrawsky, Steve W.Manzuik and Ryan Permeh, Syngress Publication, USA.
4. "Fundamentals of Network Security", 2/e, 2008, Eric Maiwald, Dreamtech press. New Delhi, India.
5. "Network Security: Private Communication in a Public World", 2/e, 2002, Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson education, New Delhi, India.

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Core Elective – III

20MCSE25d **Distributed Databases**

UNIT - 1: Introduction

Distributed data processing – What is distributed database system – Promises of DDBSs – Complicating factors – Problem areas – Distributed DBMS architecture – Data security – Semantic integrity control

UNIT - 2: Distributed Database Design, Global and Fragment Queries

A framework for distributed database design - Design of database fragmentation - Allocation of fragments - Global queries - Fragment queries - Equivalence transformations for queries - Transforming global queries into fragment queries - Distributed grouping and aggregate function evaluation - Parameter queries

UNIT - 3: Optimization of Access Strategies, Management of Distributed Transactions

A frame work for query optimization - Join queries - General queries -Framework for transaction management – Supporting atomicity of distributed transactions - Concurrency control for distributed transactions

UNIT - 4: Concurrency Control and Reliability

Foundations of distributed concurrency control - Distributed Deadlocks – Concurrency control based on timestamps – Optimistic methods for distributed concurrency control - Basic concepts of reliability – Non blocking commitment protocols - Reliability and concurrency control – Determining a consistent view of network - Detection and resolution of inconsistency - Check points and cold restart

UNIT - 5: Distributed Database Systems Commercial Systems

Commercial systems - Tandem's encompass distributed database systems - IBM's inter system communication - Features of distributed INGRES – Problems of heteregeneous distributed databases - Brief study of MULTIBASE

Text Books:

1. "Distributed Databases Principles and Systems", 1/e, 1984, Ceri. S. Pelagatti G, MCG, New York.
2. "Principles of Distributed Database Systems", 1/e, 2002, Ozsu, PEA, India.

Reference Books:

1. "Distributed Database Management Systems : A Practical Approach", 1/e, 2010, Saeed K. Rahimi, Frank S. Haug, Kindle Edition,
2. "Database Systems - A Practical Approach to Design Implementation and Management", 3/e, 2003, Thomas M. Connolly, Carolyn E. Begg, Pearson Education, New Delhi, India.
3. "A First Course in Database Systems", 3/e, 2007, Jefrey D. Ullman, Jenifer Widom, Pearson Education Asia, New Delhi, India.
4. "Object Oriented Interfaces and Databases", 1/e, 2004, Rajesh Narang, Prentice Hall, India .
5. "Fundamentals of Database Systems", 4/e, 2004, RamezElmasri&Shamkant B. Navethe, Pearson Education, New Delhi, India.

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Core Elective – IV

20MCSE26a **Human and Computer Interaction**

UNIT 1:
Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

UNIT 2:
Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

UNIT 3:
Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT 4:
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

UNIT 5:
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow.Case Studies.

COURSE OUTCOMES
After completion of course, students would be:

- Understand the structure of models and theories of human computer interaction and vision.
- Design an interactive web interface on the basis of models studied.

REFERENCES:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004 (UNITI , II & III)
2. Brian Fling, “Mobile Design and Development”, First Edition , O Reilly Media Inc., 2009 (UNIT –IV)
3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O′Reilly, 2009. (UNIT-V)

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Core Elective – IV

20MCSE26b **Computer Vision**

UNIT 1:
Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and binary image analysis

UNIT 2:
Edge detection, Edge detection performance, Hough transform, corner detection

UNIT 3:
Segmentation, Morphological filtering, Fourier transforms

UNIT 4:
Feature extraction, shape, histogram, color, spectral, texture, using CVIPtools, Feature analysis, feature vectors, distance /similarity measures, data preprocessing

UNIT 5:
Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians Classification: Discriminant Function, Supervised, Un-supervised, Semisupervised Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.

COURSE OUTCOMES
After completion of course, students would be able to:
- Developed the practical skills necessary to build computer vision applications.
- To have gained exposure to object and scene recognition and categorization from images.

REFERENCES:
1. Computer Vision: Algorithms and Applications by Richard Szeliski.
2. Deep Learning, by Goodfellow, Bengio, and Courville.
3. Dictionary of Computer Vision and Image Processing, by Fisher et al.

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M. Tech (CSE) II – Semester

L	P	C
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Core Elective – IV

20MCSE26c **Operations Research**

UNIT 1:
Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

UNIT 2
Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

UNIT 3:
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT 4
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT 5
Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

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

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M. Tech (CSE) II – Semester

L	P	C
3	0	3

Core Elective – IV

20MCSE26d **Smart Sensors and Internet of Things**

UNIT 1:
Environmental Parameters Measurement and Monitoring: Why measurement and monitoring are important, effects of adverse parameters for the living being for IOT

UNIT 2: Sensors: Working Principles: Different types; Selection of Sensors for Practical Applications Introduction of Different Types of Sensors such as Capacitive, Resistive, Surface Acoustic Wave for Temperature, Pressure, Humidity, Toxic Gas etc

UNIT 3:
Important Characteristics of Sensors: Determination of the Characteristics Fractional order element: Constant Phase Impedance for sensing applications such as humidity, water quality, milk quality Impedance Spectroscopy: Equivalent circuit of Sensors and Modeling of Sensors Importance and Adoption of Smart Sensors

UNIT 4:
Architecture of Smart Sensors: Important components, their features Fabrication of Sensor and Smart Sensor: Electrode fabrication: Screen printing, Photolithography, Electroplating Sensing film deposition: Physical and chemical Vapor, Anodization, Sol-gel

UNIT 5:
Interface Electronic Circuit for Smart Sensors and Challenges for Interfacing the Smart Sensor, Usefulness of Silicon Technology in Smart Sensor And Future scope of research in smart sensor

COURSE OUTCOMES
On completion of the course the student should be able to

- Understand the vision of IoT from a global context.
- Determine the Market perspective of IoT.
- Use of Devices, Gateways and Data Management in IoT.
- Application of IoT in Industrial and Commercial Building Automation and Real World
- Design Constraints.
- Building state of the art architecture in IoT.

REFERENCES:
1. Yasuura, H., Kyung, C.-M., Liu, Y., Lin, Y.-L., Smart Sensors at the IoT Frontier, Springer International Publishing
2. Kyung, C.-M., Yasuura, H., Liu, Y., Lin, Y.-L., Smart Sensors and Systems, Springer International Publishing

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M. Tech (CSE) II – Semester **L P C**
0 4 2

Program Core Lab – III

20MCSE27 **Data Warehousing and Mining Lab**

It is expected that student should implement concept of Data Mining and Warehousing. The open source Data Mining Tools like Rapid Miner, Weka etc. can be used to implement the concept of Data Mining and Warehousing. Some examples are as follows (Subject Teacher may add more):

1. Implementation of OLAP operations
2. Implementation of Varying Arrays
3. Implementation of Nested Tables
4. Demonstration of any ETL tool
5. Write a program of Apriori algorithm using any programming language.
6. Create data-set in .arff file format. Demonstration of preprocessing on WEKA data-set.
7. Demonstration of Association rule process on data-set contact lenses.arff /supermarket (or any other data set) using apriori algorithm.
8. Demonstration of classification rule process on WEKA data-set using j48 algorithm.
9. Demonstration of classification rule process on WEKA data-set using Naive Bayes algorithm.
10. Demonstration of clustering rule process on data-set iris.arff using simple k-means

COURSE OUTCOMES:

- Ability to understand the various kinds of tools.
- Demonstrate the classification, clustering and etc. in large data sets.
- Ability to add mining algorithms as a component to the exiting tools.
- Ability to apply mining techniques for realistic data.

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M. Tech (CSE) II – Semester

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Program Core Lab – IV

20MCSE28 **Big Data Analytics Lab**

List of Experiments

Task 1: a) Understanding the Hortonworks Sandbox for Hadoop.

b) Installing Hortonworks Sandbox – VMware Player on Windows

Task 2: Understanding and Working with basic HDFS operations such as: starting HDFS,

- Listing files in HDFS.
- Adding files and directories.
- Retrieving files.
- Deleting files.
- Shutting down the HDFS.

Task 3: Understanding and Working with Ambari for provision, manage and monitor a Hadoop cluster, and also to integrate Hadoop with the existing enterprise infrastructure.

Task 4: Write a java map-reduce program for counting the number of occurrences of each word in a text file.

Task 5: Write a java map-reduce program for mines healthcare data and perform various analysis on healthcare dataset.

Task 6: Working with PIG Latin scripts in Script mode and Grunt shell.

Task 7: Write Pig Latin scripts to illustrate Load, Store, Describe, Dump operators

Task 8: Write Pig Latin scripts to illustrate Group, Co-group, Join, Filter, Union, and Split Operators.

Task 9: Develop a Map-reduce programming with Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Task 10: Illustrate unstructured data into NoSQL data and perform various operations

COURSE OUTCOMES:

- Acquire the knowledge of big data systems and identify the main sources of Big Data in the real world.
- Analyze the frameworks like Hadoop to efficiently store retrieve and process Big Data for Analytics.
- Develop the several Data Intensive tasks using the Map Reduce Paradigm
- Investigate on novel algorithms for Clustering Classifying and finding associations in Big Data
- Design and implement successful Recommendation engines for enterprises.
- Follow the ethical principles in implementing the big data concepts
- Do experiments effectively as an individual and as a team member in a group.
- Communicate verbally and in written form, the understanding about the experiments.
- Continue updating their skill related big data and implement the concepts in future