ACADEMIC REGULATIONS, COURSE STRUCTURE

AND DETAILED SYLLABUS
UNDER

CHOICE BASED CREDIT SYSTEM (CBCS)

Effective from the Academic Year 2015-16

M. Tech. Two Year Degree Course

(MR-15 Regulations)

in

COMPUTER SCIENCE & ENGINEERING (CSE)

Department of Computer Science & Engineering

MALLA REDDY ENGINEERING COLLEGE (Autonomous)

(An Autonomous Institution approved by UGC and affiliated to JNTUH, Approved by AICTE & Accredited by NAAC with 'A' Grade and NBA & Recipient of World Bank Assistance under TEQIP Phase – II, S.C 1.1)

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

MR 15– ACADEMIC REGULATIONS (CBCS) FOR M. Tech. (REGULAR) DEGREE PROGRAMME

Applicable for the students of M. Tech. (Regular) programme from the Academic Year ***2015-16*** and onwards.

The M. Tech. Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

INSTITUTION VISION

A Culture of excellence , the hallmark of MREC as world class education center to impart Technical Knowledge in an ambience of humanity, wisdom, intellect, creativity with ground breaking discovery, in order to nurture the students to become Globally competent committed professionals with high discipline, compassion and ethical values.

INSTITUTION MISSION

Commitment to progress in mining new knowledge by adopting cutting edge technology to promote academic growth by offering state of art Under graduate and Post graduate programmes based on well-versed perceptions of Global areas of specialization to serve the Nation with Advanced Technical knowledge.

DEPARTMENT VISION

Attaining global recognition in computer science and engineering education, research and training to meet the growing needs of the industry and society.

DEPARTMENT MISSION

Quality education is imparted to develop innovative, entrepreneurial and efficient future professionals to fit in current global competitive environment.

State-of-art research facilities are provided to improve knowledge and develop technologies in the thrust areas of computer science and engineering.

Stake holders are allowed share their experiences in education and knowledge for mutual enrichment in the field of technical education.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. Impart with a sound knowledge in scientific and engineering technologies necessary to formulate, analyze, design and implement solutions to computer science & engineering related problems.
2. Carry out research in frontier areas of computer science and engineering with the capacity to learn independently throughout life to develop new technologies.
3. Train to exhibit effective technical, communication and project management skills in their profession by following ethical practices.
4. Posses leadership and team working skills to become visionary, inspirational leaders and entrepreneurs.

PROGRAMME OUTCOMES (POs)

PO1: Demonstrates knowledge in core subjects of Computer Science and Engineering with the ability to learn independently.

PO2: Acquires the ability to design and implement a software application or process that meets desired specifications within the specified constraints.

PO3: Gains the ability to solve problems relevant to industries and research organizations.

PO4: Develops innovative thinking capabilities to promote research in core and inter-disciplinary areas.

PO5: Familiarizes with modern engineering software tools and equipment to formulate and analyze computer science and engineering problems.

PO6: Coordinates and collaborates with engineers of other disciplines to work on projects involving multi-disciplines.

PO7: Engages in lifelong learning to cope with rapid technological changes in computer science and engineering.

PO8: Exhibits ethical and social responsibilities in professional and social context.

PO9: Able to identify business opportunities, lead and work in teams to become a successful entrepreneur.

1.0 ELIGIBILITY FOR ADMISSIONS :

Admission to the above programme shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.
Admissions shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test conducted by the Government of Telangana or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Govt. from time to time.

2.0 AWARD OF M.Tech. DEGREE :

2.1 A student shall be declared eligible for the award of the M.Tech. Degree, if the student pursues a course of study in not less than two and not more than four academic years. However, the student is permitted to write the examinations for two more years after four academic years of course work, failing which the student shall forfeit the seat in M. Tech. programme.

2.2 The student shall register for all 88 credits and secure all the 88 credits.

2.3 The minimum instruction days in each semester are 90.

3.0 COURSES OF STUDY :

The following specializations are offered at present for the M. Tech. programme of study.

1. Computer Science and Engineering
2. Digital Systems and Computer Electronics
3. Electrical Power Systems
4. Embedded Systems
5. Geotechnical Engineering
6. Machine Design
7. Structural Engineering
8. Thermal Engineering
9. VLSI System Design

and any other programme as approved by the University from time to time.

3.1 Departments offering M. Tech. Programmes with specializations are noted below:

CE	GTE	Geo Technical Engineering
	SE	Structural Engineering
EEE	EPS	Electrical Power Systems
ME	MD	Machine Design
	TE	Thermal Engineering
ECE	DSCE	Digital Systems and Computer Electronics
	ES	Embedded Systems
	VLSI SD	VLSI System Design
CSE	CSE	Computer Science and Engineering

4 COURSE REGISTRATION :

4.1 A 'Faculty Advisor or Counselor' shall be assigned to each student, who will advise him on the Post Graduate Programme (PGP), its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

4.2 Academic Section of the College invites 'Registration Forms' from students within 15 days from the commencement of class work for the first semester through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'SUBSEQUENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'CURRENT SEMESTER'.

4.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from the Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor and the Student).

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

4.5 Subject/ Course Options exercised through ON-LINE Registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices will also not be considered. However, if the Subject/ Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5 ATTENDANCE :

The programmes are offered on a unit basis with each subject/course being considered as a unit.

5.1 Attendance in all classes (Lectures/Laboratories etc.) is compulsory. The minimum required attendance in each theory / Laboratory etc. is 75% including the days of attendance in sports, games, NCC and NSS activities for appearing for the Semester End examination (SEE). A student shall not be permitted to appear for the Semester End Examinations (SEE) if his attendance is less than 75%.

5.2 Condonation of shortage of attendance in each subject up to 10% (65% and above and below 75%) in each semester shall be granted by the College Academic Committee (CAC).

5.3 Shortage of Attendance below 65% in each subject shall not be condoned.

5.4 Students whose shortage of attendance is not condoned in any subject are not eligible to write their end Semester End Examination of that subject and their registration shall stand cancelled.

5.5 A fee prescribed by the CAC, shall be payable towards Condonation of shortage of attendance.

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

5.7 A student shall not be promoted to the next semester unless the student satisfies the attendance requirement of the present Semester, as applicable. The student may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, the student shall not be eligible for readmission into the same class.

6 EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS: :

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Continuous Internal Evaluation and Semester End Examinations. For all Subjects/ Courses, the distribution shall be 40 marks for CIE, and 60 marks for the SEE

6.1 Theory Courses :

6.1.1 Continuous Internal Evaluation (CIE):

The CIE consists of two Assignments each of 05 marks and two mid-term examinations each of 35 marks. The CIE shall be finalized based on the 70% of the best performed and 30% of the other performance.The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.

First Assignment should be submitted before the conduct of the first mid-term examinations, and the Second Assignment should be submitted before the conduct of the second midterm examinations. The Assignments shall be as specified by the concerned subject teacher.. Each mid-term examination shall be conducted for a total duration of 120 minutes, for 35 marks.

The division of marks for CIE is as given below:

Mid – Term Examination				
Part	**Type of Questions**	**No. of questions**	**Marks per question**	**Total**
Part A	Multiple-choice questions	10	0.5	05
	Fill-in the blanks	10	0.5	05
	Sub-Total			10
Part B	Compulsory questions	5	2	10
Part C	Choice questions (3 out of 5)	3	5	15
			Mid-Term Exam Total	35
			Assignment	05
			Grand Total	40

6.1.2 Semester End Examination (SEE):

The division of marks for SEE is as given below:

Semester End Examination				
Part	**Type of Questions**	**No. of questions to be answered**	**Marks per question**	**Total**
Part A	Compulsory Questions (One from each module)	5	4	20
Part B	Choice Questions (5 out of 8) (Minimum one from each module)	5	8	40
			Grand Total	60

6.2 Practical Courses:

6.2.1 Continuous Internal Evaluation (CIE):

There will be CIE for 40 marks, shall be awarded with a distribution of 20 marks for day-to-day performance and timely submission of lab records, 5 marks for viva-voce, 15 marks for internal lab exam (best out of two exams).

6.2.2 Semester End Examination (SEE):

There will be SEE for 60 marks, shall be awarded with a distribution of 20 marks for write-up on the given experiment, 20 marks for proficiency in the exam, 10 marks for results and 10 marks for viva-voce. For conducting SEE, one internal examiner and one external examiner will be appointed by the Chief Controller of Examinations of the College. The external examiner should be selected from outside the College among the autonomous/reputed institutions, from a panel of three examiners submitted by the concerned Head of the Department.

6.3 Seminar:

There shall be two seminar presentations during I semester and II semester. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Departmental Academic Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each Seminar there will be only internal evaluation of 100 marks with a distribution of 30 marks for the report, 50 marks for presentation and 20 marks for the queries. A candidate has to secure a minimum of 50% of marks to be declared successful. If the student fails to fulfill minimum marks, the student has to reappear during the supplementary examinations.

6.4 Comprehensive Viva-Voce:

There shall be a Comprehensive Viva-Voce in III Semester. The Comprehensive Viva-Voce is intended to assess the students' understanding

of various subjects studied during the M. Tech. course of study. The Head of the Department shall be associated with the conduct of the Comprehensive Viva-Voce through a Committee. The Committee consists of the Head of the Department, one senior faculty member and an external examiner. The external examiner shall be appointed by the Chief Controller of Examinations from a panel of three examiners submitted by the concerned Head of the Department. There are no internal marks for the Comprehensive Viva-Voce and evaluates for maximum of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. If the student fails to fulfill minimum marks, the student has to reappear during the supplementary examinations.

6.5. **General:** A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the Semester End Examination and a minimum of 50% of the total marks in the Semester End Examination and Continuous Internal Evaluation taken together. In case the candidate does not secure the minimum academic requirement in any subject he has to reappear for the Semester End Examination in that subject. A candidate shall be given one chance to re-register for the subject if the internal marks secured by the candidate are less than 50% and failed in that subject. This is allowed for a maximum of three subjects and should register within two weeks of commencement of that semester class work. In such a case, the candidate must re-register for the subjects and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon the eligibility for writing the Semester End Examination in those subjects. In the event of the student taking another chance, the student's Continuous Internal Evaluation (CIE) marks and Semester End Examination (SEE) marks obtained in the previous attempt stands cancelled.

7 EXAMINATIONS AND ASSESSMENT - THE GRADING SYSTEM :

7.1 Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab / Practicals, or Seminar, or Project, etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 6 above, and a corresponding Letter Grade shall be given.

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

% of Marks Secured (Class Intervals)	Grade Points	Letter Grade (UGC Guidelines)
≥ 80%	10	O (Outstanding)
≥ 70% to < 80%	9	A+ (Excellent)
≥ 60% to < 70%	8	A (Very Good)
≥ 55% to < 60%	7	B+ (Good)
≥ 50% to < 55%	6	B (Above Average)
< 50%	0	F (Fail)
Absent	Ab	Ab

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

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

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

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

7.7 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course. The corresponding 'Credit Points' (CP) is computed by multiplying the Grade Point with Credits for that particular Subject/ Course.
Credit Points (CP) = Grade Point (GP) x Credits …. For a Course

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

7.9 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (∑CP) secured from ALL Subjects/ Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as:

$$\text{SGPA} = \left\{\sum_{i=1}^{N} C_i G_i\right\} / \left\{\sum_{i=1}^{N} C_i\right\} \ldots \text{For each Semester}$$

where 'i' is the Subject indicator index (takes into account all Subjects in a Semester), 'N'is the no. of Subjects 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to the i^{th} Subject, and G represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Subject.

7.10 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the II Semester onwards, at the end of each Semester, as per the formula

$$\text{CGPA} = \left\{\sum_{j=1}^{M} C_j G_j\right\} / \left\{\sum_{j=1}^{M} C_j\right\} \ldots \text{for all S semesters registered}$$
(i.e., upto and inclusive of S semesters, S ≥ 2)

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the I Semester onwards upto and inclusive of the

Semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the j^{th} Subject, and G_j represents the Grade Points (GP)corresponding to the Letter Grade awarded for that j^{th} Subject. After registration and completion of I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

7.11 For Calculations listed in Item 7.6 – 7.10, performance in failed Subjects/ Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/Courses will also be included in the multiplications and summations.

8. EVALUATION OF PROJECT/DISSERTATION WORK :

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

8.1 A Project Review Committee (PRC) shall be constituted with Head of the Department as Chairperson, Project Supervisor and one senior faculty member of the Departments offering the M. Tech. programme.

8.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.

8.3 After satisfying 8.2, a candidate has to submit, in consultation with his Project Supervisor, the title, objective and plan of action of his project work to the PRC for approval. Only after obtaining the approval of the PRC the student can initiate the Project work.

8.4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

8.5 A candidate shall submit his project status report in two stages at least with a gap of 3 months between them.

8.6 The work on the project shall be initiated at the beginning of the III Semester and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.
Note: *The project supervisor/guide has to ensure that the student has to publish a minimum of one paper related to the thesis in a National/International Conference/Journal.*

8.7 For the final approval by the PRC, the soft copy of the thesis should be submitted for ANTI-PLAGIARISM for the quality check and the plagiarism report should be included in the final thesis. If the copied information is less than 24%, then only thesis will be accepted for submission.

8.8 Three copies of the Project Thesis certified by the supervisor, HOD and Principal shall be submitted to the Chief Controller of Examinations for project evaluation (viva voce).

8.9 For Project work part-I in III Semester there is an internal marks of 50, the evaluation should be done by the PRC for 30 marks and Supervisor will evaluate for 20 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain. A candidate has to secure a minimum of 50% of marks to be declared successful for Project work part-I. If the student fails to fulfill minimum marks, the student has to reappear during the supplementary examination.

8.10 For Project work part-II in IV Semester there is an internal marks of 50, the evaluation should be done by the PRC for 30 marks and Supervisor will evaluate for 20 marks. The PRC will examine the overall progress of the Project Work and decide the Project is eligible for final submission or not. A candidate has to secure a minimum of 50% of marks to be declared successful for Project work part-II. If the student fails to fulfill minimum marks, the student has to reappear during the supplementary examination.

8.11 For Project Evaluation (Viva Voce) in IV Semester there is an external marks of 150 and the same evaluated by the External examiner appointed by the Chief Controller of Examinations. For this, the Head of the Department shall submit a panel of 3 examiners, eminent in that field, with the help of the supervisor/guide concerned. The candidate has to secure minimum of 50% marks in Project Evaluation (Viva-Voce) examination.

8.12 If the student fails to fulfill as specified in 8.11, based the recommendation of the external examiner, the student will reappear for the Viva-Voce examination with the revised thesis only after three months. In the reappeared examination also, fails to fulfill, the student will not be eligible for the award of the degree.

8.13 The Head of the Department shall coordinate and make arrangements for the conduct of Project Viva-Voce examination.

9. AWARD OF DEGREE AND CLASS :

9.1 A Student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secures the required number of **88** Credits (with CGPA $\geq$ 6.0), shall be declared to have 'QUALIFIED' for the award of the M.Tech. Degree in the chosen Branch of Engineering and Technology with specialization as he admitted.

9.2 Award of Class

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

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

9.3 A student with final CGPA (at the end of the PGP) < 6.00 will not be eligible for the Award of Degree.

10. WITHHOLDING OF RESULTS :

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

11. TRANSITORY REGULATIONS :

11.1 If any candidate is detained due to shortage of attendance in one or more subjects, they are eligible for re-registration to maximum of three earlier or equivalent subjects at a time as and when offered.

11.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per MR15 Academic Regulations.

12. GENERAL :

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

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

12.3 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”.

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

12.5 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the CAC is final.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	**Punishment**
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the SEE)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to that course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester. The Hall Ticket of the candidate shall be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project

		work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	Refuses to obey the orders of the Chief Controller of Examinations (CCE) / Controller of Examinations (CE) / Assistant Controller of Examinations (ACE) / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a

	the officer in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination	police cases registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred and forfeits the seat.

		Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that SEE.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the CCE for further action toward suitable punishment.	

Note: ***The student(s) found indulging in malpractices during the CIE also will be punished based on the recommendations of the College Academic Committee.***

MALLA REDDY ENGINEERING COLLEGE (Autonomous)
Department of Computer Science and Engineering

M. Tech. (Computer Science and Engineering)

MR15 - Course Structure and Syllabus

Academic Year 2015-16 (Choice Based Credit System)

(MR15 Regulations)

I SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	CC I	55101	Data Structures and Algorithm Analysis	4	--	--	4	40	60	100
2	CC II	55102	Computer System Design	4	--	--	4	40	60	100
3	CC III	55103	Computer and Communication Networks	4	--	--	4	40	60	100
4	OE I		Open Elective-I	4	--	--	4	40	60	100
5	PE I		Professional Elective –I	4	--	--	4	40	60	100
6	PE II		Professional Elective–II	4	--	--	4	40	60	100
7	Laboratory I	55104	Data Structures and Algorithms Lab	--	--	4	2	40	60	100
8	Seminar I	55105	Seminar-I	--	--	4	2	100	--	100
			Total	24	--	8	28	Contact Periods: 32		

II SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	CC IV	55106	Information Security	4	--	--	4	40	60	100
2	CC V	55107	Big Data Analytics	4	--	--	4	40	60	100
3	CC VI	55108	Web Services and Service Oriented Architecture	4	--	--	4	40	60	100
4	OE II		Open Elective-II	4	--	--	4	40	60	100
5	PE III		Professional Elective - III	4	--	--	4	40	60	100
6	PE IV		Professional Elective – IV	4	--	--	4	40	60	100
7	Laboratory II	55109	Data Analytics Lab	--	--	4	2	40	60	100
8	Seminar II	55110	Seminar-II	--	--	4	2	100	--	100
			Total	24	--	8	28	Contact Periods: 32		

III Semester

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	CV	55111	Comprehensive Viva-Voce	--	--	--	4	--	100	100
2	PR I	55112	Project work Part I	--	--	16	8	50	--	50
Total				--	--	16	12	Contact Periods: 16		

IV Semester

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	PR II	55113	Project work Part II	--	--	16	8	50	--	50
2	PR III	55114	Project Viva-Voce	--	--	--	12	--	150	150
Total				--	--	16	20	Contact Periods: 16		

*** CC – Core Course, PE – Professional Elective, CV – Comprehensive Viva – Voce, PR – Project Work**

Open Electives

Open Electives 1 & 2

Code	Group	Subject
55115	OE	Distributed Systems
55116	OE	Multi-core Architectures
55117	OE	Semantic Web and Social Networks
55118	OE	Research Methodologies
55119	OE	Advanced Data Mining
55120	OE	Pervasive Computing
55121	OE	Mobile Databases

Professional Electives

Professional Electives - 1 & 2

Code	Group	Subject
55122	PE1	Software Architecture and Design Patterns
55123	PE1	Software Process and Project Management
55124	PE1	Artificial Intelligence
55125	PE1	Advanced Database Systems
55126	PE1	Grid and Cloud Computing
55127	PE1	Storage Area Networks

Professional Electives - 3 & 4

Code	Group	Subject
55128	PE2	Software Quality Assurance and Testing
55129	PE2	System Analysis And Design
55130	PE2	Natural Language Processing
55131	PE2	Machine Learning
55132	PE2	Internet of Things
55133	PE2	Wireless Networks and Mobile Computing

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Course Code: 55101 **Credits: 4**

M.Tech. CSE -I Sem

DATA STRUCTURES AND ALGORITHM ANALYSIS

Objectives:

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

MODULE I **[10 Periods]**

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

Module II **[9 Periods]**

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

Module III **[8 Periods]**

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

Module IV **[10 Periods]**

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

Module V **[11 Periods]**

Search trees- Binary search tree-Binary search tree ADT, insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees – Definition and examples only, B-Trees-definition, insertion and searching operations, Trees

in java.util- Tree Set, Tree Map Classes, Tries(examples only),Comparison of Search trees. Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Course Code: 55102 **Credits: 4**

M.Tech. CSE -I Sem

COMPUTER SYSTEM DESIGN

Objectives:

- To apply the fundamentals of Computer Systems Design and IT in devising IT solutions.
- To Design, simulate, and analyze digital hardware.
- To Interface between basic hardware and software computing systems.
- To Simulate and evaluate different computing architectures.

Module I **[10 Periods]**

Computer Structure – Hardware, software, system software, Von-Neumann architecture – case study. IA -32 Pentium: registers and addressing, instructions, assembly language, program flow control, logic and shift/rotate instructions, multiply, divide MMX, SIMD instructions, I/O operations, subroutines. Input/ Output organization, interrupts, DMA, Buses, Interface circuits, I/O interfaces, device drivers in windows, interrupt handlers.

Module II **[8 Periods]**

Processing Unit: Execution of a complete instruction, multiple bus organization, hardwired control, micro programmed control.

Pipelining: Data hazards, instruction hazards, influence on instruction sets, data path & control consideration, and RISC architecture introduction.

Module III **[10 Periods]**

Memory: Types and hierarchy, model level organization, cache memory, performance considerations, mapping, virtual memory, swapping, paging, segmentation, replacement policies.

Module IV **[9 Periods]**

Processes and Threads: Processes, threads, inter process communication, classical IPC problems, Deadlocks.

Module – V **[9 Periods]**

File system: Files, directories, Implementation, UNIX file system.

Security: Threats, intruders, accident data loss, basics of cryptography, user authentication.

TEXT BOOKS:

1. Computer Organization – Car Hamacher, Zvonks Vranesic, SafeaZaky, Fifth Edition, McGraw Hill.
2. Modern Operating Systems, Andrew S Tanenbaum second edition Pearson/PHI.

REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson /PHI
2. Morris Mano- Computer System Architecture –third Edition-Pearson Education.
3. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
4. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/PHI.

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Course Code: 55103 **Credits: 4**

M.Tech. CSE -I Sem

COMPUTER AND COMMUNICATION NETWORKS

Objectives:

- To understand basic concepts of Internet and networking protocols
- To study the operations performed by different layers of TCP/IP reference model
- To understand the concept of wireless networks and Mobile IP
- To understand the concept of VPN and Multimedia Networking
- To study the Adhoc and Sensor Network with their related features

Module I **[12 Periods]**

Computer Networks and the Internet: What is the Internet, The Network edge, The Network core, Access Networks and Physical media, ISPs and Internet Backbones, Delay and Loss in Packet-Switched Networks, history of Computer Networking and the Internet.

Foundation of Networking Protocols: 5-layer TCP/IP Model, 7-Layer OSI Model. Internet Protocols and Addressing, Equal-Sized Packets Model: ATM.

Networking Devices: Multiplexers, Moderns, Internet access devices, Switching and Routing devices, Router structure.

Module II **[11 Periods]**

The Link Layer and Local Area Networks: Link Layer: Introduction and Services, Error-Detection and Error-Correction techniques, Multiple Access Protocols, Link Layer Addressing. Ethernet, Interconnections: Hubs and Switches, PPP: The Point-to-Point Protocol, Link virtualization.

Routing and Internetworking: Network-, Layer Routing, Least-Cost-Path algorithms, Non-Least-Cost-Path algorithms, Inter domain Routing Protocols, Inter domain Routing Protocols, Congestion Control at Network Layer.

Module III **[11 Periods]**

Logical Addressing: IPv4 Addresses, IPv6 Addresses - Internet Protocol: Internetworking, IPv4, IPv6, Transition from lPv4 to IPv6, Multicasting Techniques and Protocols: Basic Definitions and Techniques, Inter domain Multicast Protocols, Inter domain Multicast Protocols, Node level Multicast algorithms.

Transport and End-to-End Protocols: Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Mobile Transport Protocols, TCP Congestion Control.

Application Layer: Principles of Network Applications, Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Socket Programming with TCP and UDP, Building a Simple WebServer.

Module IV **[10 Periods]**

Wireless Networks and Mobile IP: Infrastructure of Wireless Networks, Wireless LAN Technologies, IEEE 802.11 Wireless Standard, Cellular Networks, Mobile JP, Wireless Mesh Networks (WMNs).

Optical Networks and WDM Systems: Overview of Optical Networks, Basic Optical Networking Devices, Large-Scale Optical Switches, Optical Routers, Wavelength allocation in Networks. Case Study: An All-Optical Switch.

Module V **[12 Periods]**

VPNs, Tunneling and Overlay Networks: Virtual Private Networks (VPNs), Multi-protocol Label Switching (MPLS). Overlay Networks.

VoIP and Multimedia Networking: Overview of IP Telephony, VoIP Signaling Protocols, Real-Time Media Transport Protocols, Distributed Multimedia Networking, Stream Control Transmission Protocol.

Mobile Ad hoc Networks: Overview of Wireless Ad hoc Networks, Routing in Ad hoc Networks, Routing Protocols for Ad hoc Networks.

Wireless Sensor Networks: Sensor Networks and Protocol Structures, Communication Energy Model, Clustering Protocols, Routing Protocols.

TEXT BOOKS:

1. Computer Networking: A Top-Down Approach Featuring the Internet, *James F Kurose,Keith W.Ross. T*hird Edition, Pearson Education 2007.
2. Computer and Communication Networks, *Noda F Mir.* Pearson Education, 2007.

REFERENCE BOOKS:

1. Data Communications and Networking, *Behrouz,A. Forouzan,* Fourth Edition, Tata McGraw Hill, 2007.
2. Guide to Networking Essentials, *Greg Tomsho, Ed Tittel, David Johnson,* Fifth Edition, Thomson.
3. An Engineering Approach to Computer Networking, *S.Keshav,* Pearson Education.
4. Campus Network Design Fundamentals, *Diane Teare, Catherine Paquet,* Pearson Education (CISCO Press)
5. Computer Networks, *Andrew* S. *Tanenbaum,* Fourth Edition, Prentice Hall.
6. The Internet and Its Protocols, A.Farrel, Elsevier.

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Course Code: **Credits: 4**

M.Tech. CSE -I Sem

Open Elective-I

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Course Code: **Credits: 4**

M.Tech. CSE -I Sem

Professional Elective-I

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Course Code: **Credits: 4**

M.Tech. CSE -I Sem

Professional Elective-II

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Course Code: 55104 **Credits: 2**

M.Tech. CSE -I Sem

DATA STRUCTURES AND ALGORITHMS LAB

Objectives:

- The fundamental design, analysis, and implementation of basic data structures.
- Basic concepts in the specification and analysis of programs.
- Principles for good program design, especially the uses of data abstraction.

Sample Problems on Data structures:

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

16. Write a Java program to perform the following operations:
    a) Insertion into a B-tree b) Searching in a B-tree

17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

REFERENCE BOOKS:

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

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

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Course Code: 55105 **Credits: 2**

M.Tech. CSE -I Sem

Seminar-I

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Course Code: 55106 **Credits: 4**

M.Tech. CSE -II Sem

Information Security

Module-I **[10 Periods]**

Computer Security:

Is There A Security Problem In Computing: What Does Security Mean?, Attacks, The Meaning of Computer Security, Computer Criminals, Methods of Defense, Terminology and Background, Substitution Ciphers, Transpositions (Permutations), Making good Encryption Algorithm, The Data Encryption Standard.

Module-II **[8 Periods]**

Program Security: Secure Programs, Non-Malicious Program Errors, Viruses and Other Malicious Code, Targeted Malicious Code.

Module-III **[12 Periods]**

Cryptography: Public-Key Cryptography and RSA, Key Management; Other public key Cryptosystems, Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security Hash Functions and MACs Hash and MAC Algorithms: Secure Hash Algorithm, Whirlpool. Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols.

Module-IV **[8 Periods]**

Authentication Applications: Kerberos, Electronic Mail Security: Pretty Good Privacy, S/MIME.

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combing Security Associations, Key Management.

Module-V **[11 Periods]**

Web Security: Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction.

Intruders: Intruders, Intrusion Detection, Password Management, Firewalls: Firewall Design and Principles, Trusted Systems.

TEXT BOOKS:

1. Security In Computing, Charles P. Pfleeger, Shari Lawrence Pfleeger, Deven Shah, Pearson Education.
2. Cryptography and Network Security, William Stallings, Fourth Edition, Pearson education.

REFERENCES:

1. Information Security, Markow, Breithaupt, Pearson Education.
2. Principles and Practices of Information Security, Michal E. Whitman and Herbert J. Mattord, Cengage Learning.
3. Network Security Essentials (Applications and Standards) by William Stallings, Pearson Education.
4. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permeh, Wiley Dreamtech.

5. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
6. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
7. Principles of Information Security, Whitman, Thomson.
8. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
9. Introduction to Cryptography, Buchmann, Springer.

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Course Code: 55107 **Credits: 4**

M.Tech. CSE -II Sem

BIG DATA ANALYTICS
(PROFESSIONAL ELECTIVE)

Objective: To understand big data analytics as the next wave for businesses looking for competitive advantage of financial and computing large amount data analytics purpose.

Module I: Introduction to BIG DATA [11 Periods]

Analytics – Nuances of big data – Value – Issues – Case for Big data – Big data options Team challenge – Big data sources – Acquisition – Nuts and Bolts of Big data. Features of Big Data - Security, Compliance, auditing and protection - Evolution of Big data – Best Practices for Big data Analytics - Big data characteristics - Volume, Veracity, Velocity, Variety – Data Appliance and Integration tools – Greenplum – Informatics.

Module II: DATA ANALYSIS [12 Periods]

Evolution of analytic scalability – Convergence – parallel processing systems – Cloud computing – grid computing – map reduce – enterprise analytic sand box – analytic data sets – Analytic methods – analytic tools – Cognos – Microstrategy - Pentaho. Analysis approaches – Statistical significance – business approaches – Analytic innovation – Traditional approaches – Iterative

Module III: STREAM COMPUTING [10 Periods]

Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window - Realtime Analytics Platform (RTAP) applications IBM Infosphere – Big data at rest – Infosphere streams – Data stage – Statistical analysis – Intelligent scheduler – Infosphere Streams

Module IV: PREDICTIVE ANALYTICS AND VISUALIZATION [12 Periods]

Predictive Analytics – Supervised – Unsupervised learning – Neural networks – Kohonen models – Normal – Deviations from normal patterns – Normal behaviors – Expert options – Variable entry - Mining Frequent item-sets - Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent item-sets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications:

Module V: FRAMEWORKS AND APPLICATIONS [10 Periods]

IBM for Big Data – Map Reduce Framework - Hadoop – Hive - – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Hbase – Impala – Analyzing big data with twitter – Big data for E-Commerce – Big data for blogs.

REFERENCES:

1. Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2012.
2. Colleen Mccue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis", Elsevier, 2007
3. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
4. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", Wiley and SAS Business Series, 2012.
6. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill, 2011.
7. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch , James Giles, David Corrigan, "Harness the Power of Big data – The big data platform", McGraw Hill, 2012.
8. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007
9. Pete Warden, Big Data Glossary, O'Reilly, 2011.
10. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

Outcomes:

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

- Identify the need for big data analytics for a domain
- Use Hadoop, Map Reduce Framework
- Apply big data analytics for a given problem
- Suggest areas to apply big data to increase business outcome
- Contextually integrate and correlate large amounts of information automatically to gain faster insights.

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Course Code: 55108 **Credits: 4**

M.Tech. CSE -II Sem

WEB SERVICES AND SERVICE ORIENTED ARCHITECTURE

Objectives:

- To Understand Web Services and implementation model for SOA
- To Understand the SOA, its Principles and Benefits
- To Understand XML concepts
- To Understand paradigms needed for testing Web Services
- To explore different Test Strategies for SOA-based applications
- To implement functional testing, compliance testing and load testing of Web Services
- To Identify bug-finding ideas in testing Web Services

Module I [12 Periods]

Evolution and Emergence of Web Services – Evolution of distributed computing. Core distributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

Module II [11 Periods]

Web Service Architecture – Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, and basic steps of implementing web services. Describing Web Services – WSDL introduction, non functional service description, WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL.

Module III [12 Periods]

Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation. SOAP : Simple Object Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.

Module IV [12 Periods]

Registering and Discovering Services : The role of service registries, Service discovery, Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model, Interfaces, UDDIImplementation, UDDI with WSDL, UDDI specification, Service Addressing and Notification,Referencing and addressing Web Services, Web Services Notification.

Module V [10 Periods]

SOA and web services security considerations, Network-level security mechanisms, Application-level security topologies, XML security standards, Semantics and Web Services, The semantic interoperability problem, The role of metadata, Service metadata, Overview of .NET and J2EE, SOAand Web Service Management, Managing Distributed System, Enterprise management Framework,Standard distributed management frameworks, Web service management, Richer schema languages,WS-Metadata Exchange.

TEXT BOOKS:

1. Web Services & SOA Principles and Technology, Second Edition, Michael P. Papazoglou.
2. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India.
3. Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson Education.

REFERENCE BOOKS:

1. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.
2. Building web Services with Java, 2nd Edition, S. Graham and others, Pearson Education.
3. Java Web Services, D.A. Chappell & T. Jewell, O'Reilly, SPD.
4. McGovern, et al., "Java web Services Architecture", Morgan Kaufmann Publishers, 2005.
5. J2EE Wer Services, Richard Monson-Haefel, Pearson Education.

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Course Code: **Credits: 4**

M.Tech. CSE -II Sem

Open Elective-II

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Malla Reddy Engineering College (Autonomous)

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Course Code: **Credits: 4**

M.Tech. CSE -II Sem

Professional Elective-III

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Course Code: **Credits: 4**

M.Tech. CSE -II Sem

Professional Elective-IV

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Course Code: 55109 **Credits: 2**

M.Tech. CSE -II Sem

DATA ANALYTICS LAB

Objectives:

- Apply data analytics for a given problem using R Language.
- Identify the need for big data analytics for a domain.
- Use Hadoop, Map Reduce Framework

Basics of R programming, Data Analysis using R; Using Hadoop for applying Map-reduce technique:

1. Demonstrate how variables are processed and data is displayed using R.
2. Using a suitable example show that R is case-sensitive.
3. Show how scalars and lists are processed in R.
4. Show how vectors are processed in R.
5. Show how matrices can be added and multiplied in R using an appropriate example.
6. Demonstrate using different colors how graphics is processed and displayed using R.
7. Using appropriate example show how graphs can be displayed using R.
8. Using appropriate example demonstrate statistical analysis using R (For example, calculation of mean, variance etc).
9. Consider any real dataset and demonstrate Linear Regression using R.
10. Consider any real dataset and demonstrate Random Forest using R.
11. Consider any real dataset and demonstrate CART (Classification and Regression Trees) using R.
12. Consider any real dataset and demonstrate Support Vector Machines (SVM) using R.
13. Consider any real dataset and demonstrate Neural Networks using R.
14. Use Apache Hadoop (or Apache Mahout) to demonstrate the Map-reduce model for Naïve Bayes Classification.
15. Use Apache Hadoop (or Apache Mahout) to demonstrate the Map-reduce model for K-means Clustering.

REFERENCES:

1. Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2012.
2. Colleen Mccue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis", Elsevier, 2007
3. Machine Learning – Tom M. Mitchell, - MGH
4. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)
5. https://www.r-project.org/
6. https://cran.r-project.org/manuals.html
7. https://mahout.apache.org/

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Course Code: 55110 **Credits: 2**

M.Tech. CSE -II Sem

Seminar-II

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Course Code: 55111 **Credits: 4**

M.Tech. CSE -III Sem

Comprehensive Viva-Voce

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Course Code: 55112 **Credits: 8**

M.Tech. CSE -III Sem

Project Work Part-I

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Course Code: 55113 **Credits: 8**

M.Tech. CSE -IV Sem

Project Work Part-II

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Course Code: 55113 **Credits:12**

M.Tech. CSE -IV Sem

Project Viva-Voce

Open Electives

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Course Code: 55115 **Credits: 4**

M.Tech. CSE

DISTRIBUTED SYSTEMS

(OPEN ELECTIVE)

Objectives:

- To explain what a distributed system is, why you would design a system as a distributed system, and what the desired properties of such systems are;
- To list the principles underlying the functioning of distributed systems, describe the problems and challenges associated with these principles, and evaluate the effectiveness and shortcomings of their solutions;
- To recognize how the principles are applied in contemporary distributed systems, explain how they affect the software design, and be able to identify features and design decisions that may cause problems;
- To design a distributed system that fulfills requirements with regards to key distributed systems properties (such as scalability, transparency, etc.), be able to recognize when this is not possible, and explain why;
- To build distributed system software using basic OS mechanisms as well as higher-level middleware and languages.

Module I **[12 Periods]**

Characterization of Distributed Systems- Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models- Introduction, Architectural and Fundamental models, Networking and Internetworking. Inter process communication. Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

Module II **[10 Periods]**

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture, case study- SUN network file systems. Name Services-Introduction, Name Services and the Domain Name System, Case study of the Global Name Service, Case study of the X.500 Directory Service.

Module III **[11 Periods]**

Peer to Peer Systems-Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, OceanStore. Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging. Coordination and Agreement - Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

Module IV **[12 Periods]**

Transactions and Concurrency control - Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency controls. Distributed Transactions - Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery, Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

Module V **[10 Periods]**

Security - Introduction, Overview of Security techniques, Cryptographic algorithms, Digital signatures, Case studies-Kerberos, TLS, 802.11 WiFi. Distributed shared memory, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, other consistency models, CORBA case study- Introduction, CORBA RMI, CORBA Services.

TEXT BOOKS

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS:

1. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.
2. Distributed Operating Systems Concepts and Design, Pradeep K.Sinha, PHI.
3. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, Tata McGraw-Hill Edition.
4. Reliable Distributed Systems, K.P.Birman, Springer.
5. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
6. Distributed Operating Systems and Algorithm Analysis, R.Chow, T.Johnson, Pearson.
7. Distributed Operating Systems, A.S.Tanenbaum, Pearson education.
8. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani & Mukesh Singhal.

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Course Code: 55116 **Credits: 4**

M.Tech. CSE

MULTI-CORE ARCHITECTURES

(OPEN ELECTIVE)

OBJECTIVES:

- To understand the recent trends in the field of Computer Architecture and identify performance related parameters
- To appreciate the need for parallel processing
- To expose the students to the problems related to multiprocessing
- To understand the different types of multi-core architectures
- To expose the students to warehouse-scale and embedded architectures

Module-I **[12 Periods]**

FUNDAMENTALS OF QUANTITATIVE DESIGN AND ANALYSIS

Classes of Computers – Trends in Technology, Power, Energy and Cost – Dependability – Measuring, Reporting and Summarizing Performance – Quantitative Principles of Computer Design – Classes of Parallelism - ILP, DLP, TLP and RLP - Multithreading - SMT and CMP Architectures – Limitations of Single Core Processors - The Multi-core era –
Case Studies of Multi-core Architectures.

Module- II **[10 Periods]**

DLP IN VECTOR, SIMD AND GPU ARCHITECTURES

Vector Architecture - SIMD Instruction Set Extensions for Multimedia – Graphics Processing Units - Detecting and Enhancing Loop Level Parallelism - Case Studies.

Module-III **[10 Periods]**

TLP AND MULTIPROCESSORS

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues - Performance Issues – Synchronization Issues – Models of Memory Consistency– Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

Module-IV **[11 Periods]**

RLP AND DLP IN WAREHOUSE-SCALE ARCHITECTURES

Programming Models and Workloads for Warehouse-Scale Computers – Architectures for Warehouse-Scale Computing – Physical Infrastructure and Costs – Cloud Computing – Case Studies.

Module-V **[9 Periods]**

ARCHITECTURES FOR EMBEDDED SYSTEMS

Features and Requirements of Embedded Systems – Signal Processing and Embedded Applications – The Digital Signal Processor – Embedded Multiprocessors - Case Studies.

REFERENCES:

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier, 5th edition, 2012.
2. Kai Hwang, “Advanced Computer Architecture”, Tata McGraw-Hill Education, 2003.

3. Richard Y. Kain, “Advanced Computer Architecture a Systems Design Approach”, Prentice Hall, 2011.
4. David E. Culler, Jaswinder Pal Singh, “Parallel Computing Architecture: A Hardware/Software Approach” , Morgan Kaufmann / Elsevier, 1997.

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

- Identify the limitations of ILP and the need for multi-core architectures.
- Discuss the issues related to multiprocessing and suggest solutions.
- Point out the salient features of different multi-core architectures and how they exploit parallelism.
- Critically analyze the different types of inter connection networks.
- Discuss the architecture of GPUs, warehouse-scale computers and embedded processors.

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Course Code: 55117 **Credits: 4**

M.Tech. CSE

SEMANTIC WEB AND SOCIAL NETWORKS

(OPEN ELECTIVE)

Objectives:

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

Module –I **[10 Periods]**

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

Module –II **[11 Periods]**

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

Module-III **[9 Periods]**

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

Module-IV **[11 Periods]**

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

Module-V **[12 Periods]**

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, R.Studer, P.Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang LuChapman and Hall/CRC Publishers,(Taylor & Francis Group)
3. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.

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Course Code: 55118 **Credits: 4**

M.Tech. CSE

RESEARCH METHODOLOGIES

(OPEN ELECTIVE)

Module- I : **[11 Periods]**

What is Research ?,What is not Research?, Meaning, aim, nature and scope of research, Characteristics and Prerequisites of research, Research needs in Engineering, Education, Science and Management., Research benefits to Society in general.

Module- II : **[10 Periods]**

Review of Literature: Role of Review, Search for related literature, On line search, Searching Web, Conducting a literature search, Evaluating, Organizing, and synthesizing the literature.

Research Problem Statement and Purpose of Research: Identifying and describing the research ,Finding the research Problem, Sources of research problem, Criteria/ Characteristics of a Good research.

Module III : **[12 Periods]**

Planning for Research Design: The Nature and role of Data in Research., Linking Data and Research Methodology, Validity of Method, Planning for Data collection, Choosing a Research Approach., Use of Quantitative / Qualitative Research Design, Feasibility of Research Design, Establishing Research Criteria, Justification of Research Methodology

Research Proposal preparation: Characteristics of a proposal, Formatting a research proposal. Preparation of proposal, Importance of Interpretation of data and treatment of data.

Module- IV: **[10 Periods]**

Statistical Techniques for Quantitative Data, Exploring the data ,Description and Analysis of Data. Role of Statistics for Data Analysis, Functions of Statistics, Estimates of Population Parameters, Parametric V/s Non Parametric methods, Descriptive Statistics, Points of Central tendency, Measures of Variability, Measures of relationship, Inferential Statistics-Estimation, Hypothesis Testing, Use of Statistical software.

Module- V: **[11 Periods]**

Research Report, Format of the Research report, Style of writing report, References and Bibliography.

TEXT BOOKS:

1.Practical Research : planning and Design(8th Edition) Paul D. Leedy and Jeanne E. Ormrod.
2..A Hand Book of Education Research NCTE
3.Methodogy of Education Research K.S. Sidhu.

REFERENCES :

1. Research Methodology. Methods & Technique : Kothari. C.R.
2. Tests, Measurements and Research methods in Behavioural Sciences- A.K. Singh.
3. Statistical Methods- Y.P. Agarwal.
4. Methods of Statistical Ananlysis- P.S Grewal.
5. Fundamentals of Statistics S.C. Gupta, V.K. Kapoor

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Course Code: 55119 **Credits: 4**

M.Tech. CSE

ADVANCED DATA MINING

(OPEN ELECTIVE)

Objectives:

- To develop the abilities of critical analysis to data mining systems and applications.
- To implement practical and theoretical understanding of the technologies for data mining
- To understand the strengths and limitations of various data mining models**.**

Module-I **[12 Periods]**

Data mining Overview and Advanced Pattern Mining

Data mining tasks – mining frequent patterns, associations and correlations, classification and regression for predictive analysis, cluster analysis , outlier analysis; advanced pattern mining in multilevel, multidimensional space – mining multilevel associations, mining multidimensional associations, mining quantitative association rules, mining rare patterns and negative patterns.

Module-II **[10 Periods]**

Advance Classification

Classification by back propagation, support vector machines, classification using frequent at terns, other classification methods – genetic algorithms, roughest approach, fuzz>set approach;

Module-III **[10 Periods]**

Advance Clustering

Density - based methods –DBSCAN, OPTICS, DENCLUE; Grid-Based methods – STING, CLIQUE; Exception – maximization algorithm; clustering High- Dimensional Data; Clustering Graph and Network Data.

Module-IV **[11 Periods]**

Web and Text Mining

Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining –unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.

Module-V **[12 Periods]**

Temporal and Spatial Data Mining

Introduction; Temporal Data Mining – Temporal Association Rules, Sequence Mining, GSP algorithm ,SPADE, SPIRIT Episode Discovery, Time Series Analysis, Spatial Mining – Spatial Mining Tasks, Spatial Clustering. Data Mining Applications.

TEXT BOOKS:

1. Data Mining Concepts and Techniques, Jiawei Hang Micheline Kamber, Jian Pei, Morgan kaufmannn.
2. Data Mining Techniques – Arun K pujari, Universities Press.

REFERENCE BOOKS:

1. Introduction to Data Mining – Pang-Ning Tan, Vipin kumar, Michael Steinbach, Pearson.
2. Data Mining Principles & Applications – T.V Sveresh Kumar, B.Esware Reddy, Jagadish S Kalimani, Elsevier.

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Course Code: 55120 **Credits: 4**

M.Tech. CSE

PERVASIVE COMPUTING

(OPEN ELECTIVE)

Objective: To understand the knowledge of various networks and its environments.

Module I: **[10 Periods]**

Wireless Networks- Emerging Technologies: Blue tooth, Wi-Fi, WiMAX, 3G ,WATM.- Mobile IP protocols -WAP push architecture-Wml scripts and applications.

Module II: **[9 Periods]**

Mobile Computing Environment: Functions-architecture-design considerations, content architecture -CC/PP exchange protocol, context manager. Data management in WAECoda files system- caching schemes- Mobility QOS. Security in mobile computing.

Module III: **[11 Periods]**

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

Module IV: **[12 Periods]**

Pervasive Computing- Principles:

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

Module V: **[10 Periods]**

Open Protocols- Service Discovery Technologies: SDP, Jini, SLP, UpnP protocols–data synchronization- SyncML framework - Context aware mobile services -Context aware sensor networks, addressing and communications. Context aware security.

REFERENCES:

1. Ivan Stojmenovic, Handbook of Wireless Networks and Mobile Computing, John Wiley & Sons Inc, Canada, 2002.
2. Asoke K Taukder, Roopa R Yavagal, Mobile Computing, Tata McGraw Hill Pub Co. , New Delhi, 2005.
3. Seng Loke, Context-Aware Computing Pervasive Systems, Auerbach Pub., New York, 2007.
4. Uwe Hansmann etl , Pervasive Computing, Springer, New York,2001.

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Course Code: 55121 **Credits: 4**

M.Tech. CSE

MOBILE DATABASES

(OPEN ELECTIVE)

Prerequisites: DBMS.

Objective: The course introduces the different knowledge discovery issues in Mobile data in World Wide Web to analyze the different algorithms commonly used by Mobile application.

Module-I: Mobile Database System. **[10 Periods]**

Introduction: Types of Mobility, Wireless Network Communication- Introduction, Continuous Connectivity. Location and Handoff Management- Introduction

Module-II: Fundamentals of Database Technology **[9 Periods]**

Conventional Database Architecture, Database Processing, Serialization of Transactions, Advanced Transaction Models.

Module-III: **[11 Periods]**

Concurrency Control Mechanisms

Introduction, Data Processing and Mobility-Introduction, Effect of Mobility on the management of Data.

Transaction Management in Mobile Database Systems

Mobile Database System, Transaction Execution in MDS,

Module-IV: Mobile Transaction Model **[12 Periods]**

Mobile Transaction Model

Execution Model Based on ACID Transaction Framework, Pre-write Transaction Execution Model, Mobile Transaction Model, Data Consistency in Intermittent Connectivity, consistency Model, Weak Connectivity Operation, A Consistency Restoration Schema, Concurrency Control Mechanism, Transaction Commit, Commitment of Mobile Transactions, Transaction Commitment in Mobile Database Systems.

Module-V: **[12 Periods]**

Mobile Database Recovery

Introduction, Log Management in Mobile Database Systems, Mobile Database Recovery Schemes. **Wireless Information Broadcast:**Introduction, Broadcast Disk, Broadcast Infrastructure, Exponential Index, Location-Based Indexing, On-Demand Data Scheduling, Data Dissemination System.

REFERENCES:

1. Vijay Kumar, "Mobile Database Systems", Wiley, 2006.

Outcomes:

1. The student will learn various models in mobile databases.
2. The knowledge is useful to make data retrieval for the mobile database.

Professional Electives

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Course Code: 55122 **Credits: 4**

M.Tech. CSE I Sem

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

(PROFESSIONAL ELECTIVE)

Objectives:

- To study the different types of Software Architectures
- To implement the various types patterns such as Creational, Structural patterns and Behavioral patterns
- To learn case studies in utilizing architectural structures

Module I **[11 Periods]**

Envisioning Architecture: Architecture Business Cycle, Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.

Creating Architecture: Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

Module II **[10 Periods]**

Analyzing Architectures: Architecture Evaluation, Architecture design decision making, ATAM, CBAM.

Module III **[09 Periods]**

Moving from one system to many: Software product lines, building systems from off the shelf components, Software architecture in future.

Module IV **[11 Periods]**

Patterns: Pattern Description, Organizing catalogs, role in solving design problems, selection and usage.

Creational and Structural patterns: Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight, Proxy.

Module V **[12 Periods]**

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

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

TEXT BOOKS:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements &Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education, 1995.

REFERENCE BOOKS:

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001

3. Pattern Oriented Software Architecture, F.Buschmann &others, John Wiley & Sons.
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006
6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
7. Design Patterns in C#, Steven John metsker, Pearson education, 2004.

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Course Code: 55123 **Credits: 4**

M.Tech. CSE I Sem

SOFTWARE PROCESS AND PROJECT MANAGEMENT

(PROFESSIONAL ELECTIVE)

Objectives:

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

Module I **[10 Periods]**

Software Process Maturity: Software maturity Framework**,** Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.

Process Reference Models: Capability Maturity Model (CMM)**,** CMMI, PCMM, PSP, TSP.

Module II **[12 Periods]**

Software Project Management Renaissance: Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.

Life-Cycle Phases and Process artifacts: Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model based software architectures.

Module III **[12 Periods]**

Workflows and Checkpoints of process: Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments.

Process Planning: Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

Module IV **[11 Periods]**

Project Organizations: Line-of-business organizations, project organizations, evolution of organizations, process automation.

Project Control and process instrumentation: The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, and metrics automation.

Module V **[09 Periods]**

CCPDS-R Case Study and Future Software Project Management Practices: Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

TEXT BOOKS:

1. Managing the Software Process, Watts S. Humphrey, Pearson Education.
2. Software Project Management, Walker Royce, Pearson Education.

REFERENCE BOOKS:

1. Effective Project Management: Traditional, Agile, Extreme, Robert Wysocki, Sixth Edition, Wiley India, rp2011.

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

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Course Code: 55124 **Credits: 4**

M.Tech. CSE I Sem

ARTIFICIAL INTELLIGENCE

(PROFESSIONAL ELECTIVE)

Objective: This course contributes to the development of the following capabilities: enabling knowledge, problem solving and critical analysis

Module I: Introduction of AI [12 Periods]

Introduction to Artificial Intelligence, Artificial Intelligence Problems, Artificial Intelligence Techniques, problems, Problem space and search-defining the problem as a state space search, Production System, Problem characteristics Heuristic Search Technologies Generate & Test Hill Climbing, Best First search, Problem reduction, Constraint satisfaction, Means End Analysis

Module II: Representation of Knowledge [11 Periods]

Knowledge Representation, Knowledge using predicate logic-representing simple facts in logic, representing instance and is relationships, computable functions and predicates resolution. Representing Knowledge Using Rules: Procedural Vs Declarative knowledge, Logic Programming, Forward Vs Backward Reasoning, Matching, Control Knowledge.

Module II: Symbolic Reasoning under uncertainty [12 Periods]

Introduction to Non-monotonic Reasoning, logics for Non-monotonic Reasoning, Implementation: depth first search-Dependency – Directed Backtracking. Justification-based truth maintenance, logic based truth maintenance systems Statistical Reasoning-probability and Bayes theorem, certainty factors and rule-base systems Bayesian networks, dempster-shaffer theory. Weak Slot and Filler Structures, Semantic nets, Frames.

Module IV: Structures [10 Periods]

Strong slot and filler structures, Conceptual dependencies, Scripts. Game Planning Overview – an example domain-Block world, Components of a Planning System, Goal State Planning, Non Linear Planning using constraint posting, Hierarchical Planning.

Module V: Natural Language Processing [12 Periods]

A: Basics

Introduction, Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing.

B: Artificial Neural Networks

Introduction and Fundamentals of Artificial Neural Networks: Biological prototype, Artificial Neuron, Single layer Artificial, Neural Networks, Multilayer Artificial Neural Networks, Training of Artificial Neural Networks.

TEXT BOOKS:

1. Artificial Intelligence- Rich E & Knight K TMH (1991)
2. Neural Computing: Theory and practice – Waserman.

REFERENCES:

1. Artificial Intelligence Structures and Strategies complex problem Solving – George F. Lugar Pearson Education.

Outcomes: Upon completion of this course students can able to:

1. Describe the key components of the artificial intelligence (AI) field
2. Describe search strategies and solve problems by applying a suitable search method
3. Describe mini-max search and alpha-beta pruning in game playing.
4. Describe and apply knowledge representation
5. Describe and list the key aspects of planning
6. Describe and apply probability theorem and Bayesian networks.
7. Describe the key aspects of intelligent agents
8. Describe the key aspects of Evolutionary computation, including genetic algorithms and genetic programming.
9. Describe the key aspects of Machine learning

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Course Code: 55125 **Credits: 4**

M.Tech. CSE – I Sem

ADVANCED DATABASE SYSTEMS

(PROFESSIONAL ELECTIVE)

Objectives:

- History of a database and how to design a database
- How to convert the design into the appropriate tables
- Handling Keys appropriately
- Enforcing Integrity Constraints to keep the database consistent
- Normalizing the tables to eliminate redundancies
- Querying relational data
- Optimizing and processing the queries
- Storage Strategies for easy retrieval of data through index
- Triggers, procedures and Cursors ,Transaction management
- Distributed databases management system concepts and Implementation

Module I **[12 Periods]**

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

Module II **[10 Periods]**

Introduction to Schema Refinement– Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms- First, Second, Third Normal forms – BCNF –Properties of Decompositions- Loss less- join Decomposition, Dependency preserving Decomposition, Schema Refinement in database Design – Multi valued Dependencies – Fourth Normal Form, Join Dependencies, Fifth Normal form.

Module III **[12 Periods]**

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

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

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

Module IV **[11 Periods]**

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

Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks. Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert and Delete. Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendable vs. Linear Hashing.

Module V **[12 Periods]**

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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Course Code: 55126 **Credits: 4**

M.Tech. CSE I Sem

GRID AND CLOUD COMPUTING

(PROFESSIONAL ELECTIVE)

Objectives:

- To implement Basics, techniques and tools for Grid & Cloud Computing
- To understand any kind of heterogeneous resources over a network using open standards
- To implement the Service models

Module-I **[12 Periods]**

System models for advanced computing –clusters of cooperative computing, grid computing and cloud computing; software systems for advanced computing-service oriented software and paralleled distributed programming models with introductory details, Features of grid and cloud platform.

Module-II **[10 Periods]**

Cloud Computing services models and features in Saas, Paas and Iaas.Service oriented architecture and web services; Features of cloud computing architectures and simple case studies.

Module-III **[11 Periods]**

Virtualization- Characteristic features, Taxonomy Hypervisor, Virtualization and Cloud Computing, Pros and Cons of Cloud Computing, Technology Examples/Case Studies.

Module-IV **[8 Periods]**

Cloud programming Environmental- Map Reduce Hadoop Library from Apache, Open Source Cloud Software Systems –Eucalyptus.

Module-V **[9 Periods]**

Grid Architecture and Service modeling, Grid resource management, Grid Application trends.

TEXT BOOKS:

1. Distributed and Cloud Computing, Kaittwang Geoffrey C.Fox and Jack J Dongrra, Elsevier India 2012.
2. Mastering Cloud Computing- Raj Kumar Buyya, Christian Vecchiola and S.Tanurai Selvi, TMH, 2012.

REFERENCE BOOKS:

1. Cloud Computing, John W. Ritting House and James F Ramsome, CRC Press, 2012.
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2012.

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Course Code: 55127 **Credits: 4**

M.Tech. CSE I Sem

STORAGE AREA NETWORKS

(PROFESSIONAL ELECTIVE)

Objectives:

- To understand Storage Area Networks characteristics and components.
- To become familiar with the SAN vendors and their products
- To learn Fibre Channel protocols and how SAN components use them to communicate with each other
- To become familiar with Cisco MDS 9000 Multilayer Directors and Fabric Switches Thoroughly learn Cisco SAN-OS features.
- To understand the use of all SAN-OS commands. Practice variations of SANOS features

Module I: **[10 Periods]**

Introduction to Storage Technology: Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, core elements of a data center infrastructure, role of each element in supporting business activities

Module II: **[12 Periods]**

Storage Systems Architecture: Hardware and software components of the host environment, Key protocols and concepts used by each component ,Physical and logical components of a connectivity environment ,Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components , Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4,RAID 5, RAID 0+1, RAID 1+0, RAID 6, Compare and contrast integrated and modular storage systems ,High-level architecture and working of an intelligent storage system

Module III: **[12Periods]**

Introduction to Networked Storage: Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IPSAN, Benefits of the different networked storage options, understand the need for long-term archiving solutions and describe how CAS fulfills the need, understand the appropriateness of the different networked storage options for different application environments

Module IV: **[13 Periods]**

Information Availability & Monitoring & Managing Datacenter: List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, Differentiate between business continuity (BC) and disaster recovery (DR) ,RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures ,Architecture of backup/recovery and the different backup/recovery topologies , replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center

Module V: Securing Storage and Storage Virtualization: [12 Periods]

Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain, Virtualization technologies, block-level and file level virtualization technologies and processes

Case Studies: The technologies described in the course are reinforced with EMC examples of actual solutions.Realistic case studies enable the participant to design the most appropriate solution for given sets of criteria.

TEXT BOOK:

1. EMC Corporation, Information Storage and Management, Wiley.

REFERENCE BOOKS:

1. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne, 2003.
2. Marc Farley, "Building Storage Networks", Tata McGraw Hill ,Osborne, 2001.
3. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002

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Course Code: 55128 **Credits: 4**

M.Tech. CSE II Sem

SOFTWARE QUALITY ASSURANCE AND TESTING

(PROFESSIONAL ELECTIVE)

Objectives:

- Describe and determine the purpose and importance of Software Quality Assurance Framework and Standards SQA Framework.
- To study about SQA Metrics and Measurement Software Quality Metrics.
- To study about Software Testing Strategy, Environment, Methodology and Techniques.
- Learn about the Testing Specialized Systems and Applications

Module I **[12 Periods]**

Software Quality Assurance Framework and Standards SQA Framework: What is Quality? Software Quality Assurance, components of Software Quality Assurance.

Software Quality Assurance Plan: Steps to develop and implement a Software Quality Assurance Plan.

Quality Standards: ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma and 6 Sigma.

Module II **[11 Periods]**

Software Quality Assurance Metrics and Measurement Software Quality Metrics: Product Quality metrics, In-Process Quality Metrics, Metrics for Software Maintenance, Examples of Metric Programs.

Software Quality Metrics methodology: Establish quality requirements, Identify Software quality metrics, implement the software quality metrics, analyze software metrics results, and validate the software quality metrics.

Software Quality Indicators – Fundamentals in Measurement theory.

Module III **[10 Periods]**

Software Testing Strategy and Environment: Establishing testing policy, structured approach to testing, test factors, Economics of System Development Life Cycle (SDLC) Testing.

Software Testing Methodology: Defects hard to find, verification and validation, functional and structural testing, workbench concept, eight considerations in developing testing methodologies, testing tactics checklist.

Module IV **[10 Periods]**

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

Software Testing Tools : Taxonomy of Testing tools, Methodology to evaluate automated testing tools, Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, JMetra, JModule and Cactus.

Module V **[11 Periods]**

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.
Testing Specialized Systems and Applications: Testing Client/Server–Web applications, Testing off the Shelf Components, Testing Security, Testing a Data Warehouse.

TEXT BOOKS:

1. Effective Methods for Software Testing, 2nd Edition, William E. Perry, Second Edition, Wiley India, 2006.
2. Software Quality, Mordechai Ben-Menachem/Garry S. Marliss, Thomson Learning Publication, 1997.

REFERENCE BOOKS:

1. Testing and Quality Assurance for Component-based Software, by Gao, Tsao and Wu, Artech House Publishers.
2. Software Testing Techniques, by Bories Beizer, Second Edition, Dreamtech Press.
3. Managing the Testing Process, by Rex Black, Wiley.
4. Handbook of Software Quality Assurance, by G. Gordon Schulmeyer, James I.McManus, Second Edition, International Thomson Computer Press.
5. Software Testing and continuous Quality Improvement, by William E.Lewis, Gunasekaran Veerapillai, Second Edition, Auerbach Publications.
6. Metrics and Models for Software Quality Engineering, by Stephen H. Kan, by Pearson Education Publication
7. Software Testing Tools, K.V.K.K. Prasad, Dream tech press, 2008.
8. Practical Software Testing, Ilene Burnstein, Springer, 2003.
9. Software Testing, Srinivasan Desikan & Gopalaswamy Ramesh, Pearson Education, 2006.
10. Software testing techniques, Scott Loveland & Geoffrey Miller, Shroff Publishers, 2005.
11. Software Quality, Martin Wieczorek & Dirk Meyerhoff, Springer, 2001.

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Course Code: 55129 **Credits: 4**

M.Tech. CSE II Sem
SYSTEM ANALYSIS AND DESIGN
(PROFESSIONAL ELECTIVE)

Prerequisite: NIL

Objective: To understand the system analysis and design with maximum resources utilization.

Module I: Introduction **[12 Periods]**

A: Data and Information

Types of information: operational, tactical, strategic and statutory – why do we need information systems – management structure – requirements of information at different levels of management – functional allocation of management – requirements of information for various functions – qualities of information – small case study

B: Systems Analysis and Design Life Cycle

Requirements determination – requirements specifications – feasibility analysis – final specifications – hardware and software study – system design – system implementation – system evaluation – system modification. Role of systems analyst – attributes of a systems analyst – tools used in system analysis .

C: Information gathering

strategies – methods – case study – documenting study – system requirements specification – from narratives of requirements to classification of requirements as strategic, tactical, operational and statutory. Example case study .

Module II: **[11 Periods]**

A: Feasibility analysis

Deciding project goals – examining alternative solutions – cost – benefit analysis – quantifications of costs and benefits – payback period – system proposal preparation for managements – parts and documentation of a proposal – tools for prototype

B: Tools for systems analysts

Data flow diagrams – case study for use of DFD, good conventions – leveling of DFDs – leveling rules – logical and physical DFDs – software tools to create DFDs.

C: Structured systems analysis and design

Procedure specifications in structured English – examples and cases – decision tables for complex logical specifications – specification oriented design vs procedure oriented design

Module III: **[12 Periods]**

A: Data oriented systems design

Entity relationship model – E-R diagrams – relationships cardinality and participation – normalizing relations – various normal forms and their need – some examples of relational data base design.

B: Data input methods

Coding techniques – requirements of coding schemes – error detection of codes – validating input data – input data controls interactive data input

C: Designing outputs

Output devices – designing output reports – screen design – graphical user interfaces – interactive I/O on terminals.

Module IV: [12 Periods]

A: Object oriented systems modeling

what are objects? – why objects? – objects and their properties – classes – inheritance – polymorphism – how to identify objects in an application – how to model systems using objects – some cases of object oriented system modeling

B: Control

Audit and security of information systems – why controls are needed – objectives of control – techniques used in control – auditing information systems – auditing around, through and with the computer – testing information systems – types of tests – how to generate tests – security of information systems – disaster recovery – business process continuity

C: Systems analysis and design in the era of electronic commerce

B2B, B2C and C2C e-commerce – advantages and disadvantages of e-commerce. E-commerce system architecture – physical networks, logical network, world wide web, web-services – html, XML.

Module V: [10 Periods]

A: Electronic data interchange

EDI standards – virtual private networks – XML and EDI. (2 lectures).

B: Security of e-commerce transactions

Firewalls – encryption methods – symmetric and asymmetric encryption – digital signature – certifying authorities for signatures – legal status of e-commerce transactions

C: Payment systems in e-commerce

Cheque payment, credit card payments, e-cash payments.

D: Complete system analysis and design case studies

A system for journal acquisition in libraries – walk through the entire life

References:

1. "Systems Analysis and Design" Alan Dennis, Barbara Haley Wixom, Roberta M. Roth
2. "Analysis and Design of Information Systems" by Rajaraman V
3. Systems Analysis and Design, Global Edition, 9/E: Kenneth Kendall: Julie Kendall Pearson ninth edition

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Course Code: 55130 **Credits: 4**

M.Tech. CSE II Sem

NATURAL LANGUAGE PROCESSING

(PROFESSIONAL ELECTIVE)

Objectives:

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

Module I **[12 Periods]**

Introduction and Overview What is Natural Language Processing, hands-on demonstrations .Ambiguity and uncertainty in language, Turing test.

Regular Expressions Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology. Exploring a large corpus with regex tools.

P**rogramming in Python** An introduction to programming in Python. Variables, numbers, strings, arrays, dictionaries, conditionals, iteration. The NLTK (Natural Language Toolkit)

String Edit Distance and Alignment Key algorithmic tool: dynamic programming, a simple example, use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction, and machine translation.

Module II **[11 Periods]**

Context Free Grammars Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence from both directions **Non-probabilistic Parsing** Efficient CFG parsing with CYK, another dynamic programming algorithms. Early parser. Designing a little grammar, and parsing with it on some test data.

Probability Introduction to probability theory Joint and conditional probability, marginal, independence, Bayes rule, combining evidence. Examples of applications in natural language.

Information Theory The "Shannon game"--motivated by language! Entropy, cross entropy, information gain. Its application to some language phenomena.

Module III **[12 Periods]**

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

Module IV **[10 Periods]**

Probabilistic Context Free Grammars Weighted context free grammars. Weighted CYK. Pruning and beam search.

Parsing with PCFGs: A tree bank and what it takes to create one. The probabilistic version of CYK. Also: How do humans parse? Experiments with eye-tracking. Modern parsers.

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

Module V **[12 Periods]**

Maximum Entropy Markov Models & Conditional Random Fields Part-of-speech tagging, noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines. State-of-the-art models for NLP.

Lexical Semantics Mathematics of Multinomial and Dirichlet distributions, Dirichlet as a smoothing for multinomial's

Information Extraction & Reference Resolution- Various methods, including HMMs. Models of anaphora resolution. Machine learning methods for co reference.

TEXT BOOKS:

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

REFERENCES BOOKS:

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

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Course Code: 55131 **Credits: 4**

M.Tech. CSE II Sem

MACHINE LEARNING

(PROFESSIONAL ELECTIVE)

Objectives:

- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To understand the basic theory underlying machine learning.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To be able to read current research papers and understands the issues raised by current research.

Module I **[10 Periods]**

INTRODUCTION - Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning.

Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

Module II **[13 Periods]**

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Artificial Neural Networks – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition Advanced topics in artificial neural networks

Evaluation Hypotheses – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

Module III **[11 Periods]**

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm.

Computational learning theory – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite

Hypothesis Spaces, The mistake bound model of learning –

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

Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

Module IV **[11 Periods]**

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

Analytical Learning - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

Module V **[12 Periods]**

Combining Inductive and Analytical Learning – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators, **Reinforcement**

Learning – Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

TEXT BOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)

REFERENCE BOOKS:

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

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Course Code: 55132 **Credits: 4**

M.Tech. CSE II Sem

INTERNET OF THINGS
(PROFESSIONAL ELECTIVE)

Objective: To learn the basic issues, policy and challenges in the Internet and understand the components and the protocols in Internet with manage the resources in the Internet. Deploy the resources into business and the cloud and internet environment.

Module I: INTRODUCTION [10 Periods]

A: Basics of Internet and its terms

Definition – phases – Foundations – Policy– Challenges and Issues - identification - security –privacy. Components in internet of things**:** Control Units – Sensors – Communication modules –Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks –Mobile Internet – Wired Communication

Module II: PROGRAMMING THE MICROCONTROLLER FOR IOT [11 Periods]

A: IOT on sensor and cloud

Basics of Sensors and actuators – examples and working principles of sensors and actuators – Cloud computing and IOT – Arduino/Equivalent Microcontroller platform – Setting up the board -Programming for IOT – Reading from Sensors

B: Communication

Connecting microcontroller with mobile devices – communication through blue tooth and USB – connection with the internet using wifi / Ethernet.

Module III: RESOURCE MANAGEMENT IN THE INTERNET OF THINGS [11 Periods]

A: IOT Resources and its objects

Clustering - Software Agents - Data Synchronization - Clustering Principles in an Internet of Things Architecture - The Role of Context - Design Guidelines -Software Agents for Object – Data Synchronization- Types of Network Architectures - Fundamental Concepts of Agility and Autonomy-Enabling Autonomy and Agility by the Internet of Things-Technical Requirements for Satisfying the New Demands in Production - The Evolution from the RFID-based EPC Network to an Agent based Internet of Things- Agents for the Behaviour of Objects.

Module IV: BUSINESS MODELS FOR THE INTERNET OF THINGS [11 Periods]

A: IOT with Business models

The Meaning of DiY in the Network Society- Sensor-actuator Technologies and Middleware as a Basis for a DiY Service Creation Framework - Device Integration - Middleware Technologies Needed for a DiY Internet of Things Semantic Interoperability as a Requirement for DiY Creation -Ontology- Value Creation in the Internet of Things-Application of Ontology Engineering in the Internet of Things-Semantic Web-Ontology - The Internet of Things in Context of EURIDICE -Business Impact.

Module V: FROM THE INTERNET OF THINGS TO THE WEB OF THINGS

[10 Periods]

A: Transition of IOT to WEB

Resource-oriented Architecture and Best Practices- Designing REST ful Smart Things – Webenabling Constrained Devices - The Future Web of Things - Set up cloud environment – send data from microcontroller to cloud – Case studies – Open Source e-Health sensor platform – Be Close Elderly monitoring – Other recent projects.

References:

1. Charalampos Doukas , Building Internet of Things with the Arduino, Create space, April 2002.
2. Dieter Uckelmann et.al, "Architecting the Internet of Things", Springer, 2011
3. Luigi Atzor et.al, "The Internet of Things: A survey, ", Journal on Networks, ElsevierPublications, October, 2010
4. http://postscapes.com/
5. http://www.theinternetofthings.eu/what-is-the-internet-of-things

OUTCOMES: At the end of this course the students will be able to:

1. Identify the components of IOT.
2. Design portable IOT using appropriate boards.
3. Program the sensors and controller as part of IOT.
4. Develop schemes for the applications of IOT in real time scenarios.
5. Establish the communication to the cloud through WIFI/ Bluetooth.
6. Manage the internet resources.
7. Model the Internet of things to business.

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Course Code: 55133 **Credits: 4**

M.Tech. CSE II Sem

WIRELESS NETWORKS AND MOBILE COMPUTING

(PROFESSIONAL ELECTIVE)

Objectives:

The main objective of this course is to provide the students with the competences required for understanding and using the communications component of an universal communications environment. Students will be provided, in particular, with the knowledge required to understand emerging communications networks, their computational demands, the classes of distributed services and applications enabled by these networks, and the computational means required to create the new networks and the new applications.

Module I **[12 Periods]**

WIRELESS NETWORKS: Wireless Network, Wireless Network Architecture, Wireless Switching Technology, Wireless Communication problem, Wireless Network Reference Model, Wireless Networking Issues & Standards.

MOBILE COMPUTING: Mobile communication, Mobile computing, Mobile Computing Architecture, Mobile Devices, Mobile System Networks, Mobility Management

Module II **[10 Periods]**

WIRELESS LAN: Infra red Vs radio transmission, Infrastructure and Ad-hoc Network, IEEE 802.11:System Architecture, Protocol Architecture, 802.11b, 802.11a, Newer Developments, HIPERLAN 1, HIPERLAN 2, Bluetooth : User Scenarios, Architecture.

Module III **[11 Periods]**

GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS (GSM): Mobile Services, System Architecture, Protocols, Localization & Calling, Handover, Security.

GPRS: GPRS System Architecture,

UMTS: UMTS System Architecture.

LTE: Long Term Evolution

Module IV **[10 Periods]**

MOBILE NETWORK LAYER: Mobile IP: Goals, Assumptions, Entities and Terminology, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations, Dynamic Host Configuration Protocol (DHCP)

Module V **[11 Periods]**

MOBILE TRANSPORT LAYER: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP, TCP over 2.5G/3G Wireless Networks.

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, Pearson Education, Second Edition, 2008.
2. Dr. Sunilkumar, et al “Wireless and Mobile Networks: Concepts and Protocols”, Wiley India.
3. Raj Kamal, “Mobile Computing”, OXFORD UNIVERSITY PRESS.

REFERENCE BOOKS:

1. Asoke K Talukder, et al, “Mobile Computing”, Tata McGraw Hill, 2008.
2. Matthew S.Gast, “802.11 Wireless Networks”, SPD O’REILLY.
3. Ivan Stojmenovic, “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2007.
4. Kumkum Garg, “Mobile Computing”, Pearson.
5. Handbook of Security of Networks, Yang Xiao, Frank H Li, Hui Chen, World Scientific, 2011.