Rajeev Gandhi Memorial College of Engineering and Technology

Autonomous institution

(Affiliated to J.N.T.U.A, Ananthapuramu)

ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABI M.Tech. (Regular) from 2019-20

For pursuing Two year Master (post graduate) Degree of study in Engineering (M.Tech.), offered by Rajeev Gandhi Memorial College of Engineering and Technology, Nandyal - 518501 under Autonomous status and herein referred to as RGMCET (Autonomous).

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year **2019-20** onwards. Any reference to "Institute" or "College" in these rules and regulations shall stand for Rajeev Gandhi Memorial College of Engineering and Technology (Autonomous).

All the rules and regulations, specified hereafter shall be read as a whole for the purpose of interpretation as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, Rajeev Gandhi Memorial College of Engineering and Technology shall be the Chairman, Academic Council.

Academic Regulations 2019 for M.Tech. (Regular)

(Effective for the students admitted into first year from the Academic Year 2019-20)

The M.Tech. Degree of Jawaharlal Nehru Technological University Anantapur, Ananthapuramu shall be conferred on candidates who are admitted to the M.Tech. program at RGMCET, Nandyal and they shall fulfil all the requirements for the award of the Degree.

1.0 Eligibility for Admissions:

Admission to the above program shall be made subject to the eligibility, qualifications and specialization prescribed by Andhra Pradesh State Council of Higher Education (APSCHE) from time to time.

Admissions shall be made on the basis of merit rank obtained in GATE examination or PGCET conducted by any University of Andhra Pradesh designated by Govt. of A. P., or on the basis of any other order of merit prescribed by APSCHE, subject to the reservations prescribed by the Government of A. P. from time to time.

2.0 Award of M.Tech. Degree:

2.1 The student shall be declared eligible for the award of the M.Tech. degree, if he/she pursues a course of study and completes it successfully for not less than prescribed course work duration and not more than double the prescribed course work duration.

2.2 The student, who fails to fulfill all the academic requirements for the award of the degree within double the course work duration from the year of his admission, shall forfeit his seat in M.Tech. course.

2.3 The minimum clear instruction days for each semester shall be 95.

3.0 Courses of Study:

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

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1. Computer Science (CSE)
2. Embedded Systems (ECE)
3. Machine Design (Mechanical Engineering)
4. Power Electronics (EEE)
5. Structural Engineering (CE)

And any other course as approved by the appropriate authorities from time to time.

4.0 Course pattern:

4.1 The entire course of study is of four semesters. During the first and second semesters the student has to undergo course work and during the third and fourth semesters the student has to carry out project work.

4.2 The student shall be eligible to appear for the End Examination in a subject, but absent at it or has failed in the End Examination may appear for that subject at the supplementary examination.

I Semester

S. No.	Subject Code	Subject	L	T	P	Contact hrs./wk.	Credits
1	Core 1		3			3	3
2	Core 2		3			3	3
3	Program specific elective	1. 2. 3.	3			3	3
4	Program specific elective	1. 2. 3.	3			3	3
5	Subject	Research Methodology & IPR	3	0		3	3
6	Audit Course		3	--		--	--
7	Lab 1	1			3	3	1.5
8	Lab 2	2			3	3	1.5
9	CCE	Continuous Comprehensive Evaluation		0	4	2	2
Total:			15		10	25	20

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II Semester

S. No.	Subject Code	Subject	L	T	P	Contact hrs./wk.	Credits
1	Core 3		3			3	3
2	Core 4		3			3	3
3	Program specific elective	1. 2. 3.	3			3	3
4	Program specific elective/MOOCs	1. 2. 3.	3			3	3
5	Audit Course		3			--	--
6	Lab 3	1.	0	0	3	3	1.5
7	Lab 4	2.	0	0	3	3	1.5
8	Mini Project	3			3	3	1.5
9	CCE	Continuous Comprehensive Evaluation	0	0	4	4	2
Total:			12		8	20	18.5

III Semester

S. No.	Subject Code	Subject	L	T	P	Contact hrs./wk.	Credits
1	Program specific elective	1. 2. 3.	3	0	0	3	3
2	Open Elective/MOOCs	1. 2. 3.	3	0	0	3	3
3	CCE	Continuous Comprehensive Evaluation			4	4	2
5	Main Project	Phase 1	0	0	18	18	09
Total:			6		22	28	17

Audit course 1 & 2

1. English for Research Paper Writing, 2. Disaster Management, 3. Sanskrit for Technical Knowledge

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4. Value Education, 5. Constitution of India, 6. Pedagogy Studies, 7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

IV Semester

S. No.	Subject Code	Subject	L	T	P	Contact hrs. /wk.	Credits
1	Technical Seminar						1.5
2	Main Project	Phase 2	0	0	26	26	13
Total:						26	14.5

Table 1: Credits

Subject	Semester			
	Periods /Week	Credits	Internal marks	External marks
Theory	03	03	40 (25 Internal Test+15 Assignment)	60
Practical	03	1.5	40	60
Seminar		2	50	
Continuous Comprehensive Evaluation	04	02	40	60
Project Phase-1	18	09		
Project Phase-2	26	13		

Table2: Course pattern

Semester	No.of Subjects	Number of Labs	Total credits	
First	02-Subjects 02-Program Specific Electives 01-Research Methodology	 02 - Labs CCE	2x3=6 2x3=6 1x3=3 2x1.5=3 1x2=2	20
Second	02-Subjects 01-Program Specific Elective 01-MOOC/Elective	 02 – Labs Mini project CCE	2x3=6 1x3=3 1x3=3 2x1.5=3 1x1.5=1.5 1x2=2	18.5

Third	01Program Specific Elective 01 Open Elective	 Main Project Phase-1 CCE	1x3=3 1x3=3 1x9=9 1x2=2	17
Fourth		Technical Seminar Main Project Phase-2	1x1.5=1.5 1x13=13	14.5
			Total credits	**70**

5.0 Attendance:

5.1 The candidate shall be deemed to have eligibility to write end semester examinations, if he has secured a minimum of 75% of attendance in aggregate of all the subjects.

5.2 Condonation of shortage of attendance up to 10%, i. e. 65% and above and below 75% may be given by the College academic committee consisting of Principal, Head of the Department and a senior faculty member.

5.3 Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence.

5.4 Shortage of attendance below 65% shall in no case be condoned.

5.5 The candidate shall not be promoted to the next semester unless he fulfils the attendance requirements of the previous semester.

5.6 Attendance in each subject will be recorded in the marks memo.

5.7 The attendance in each subject will be recorded in the Marks memo.

6.0 Evaluation:

6.1 For theory subjects the distribution shall be 40 marks for Internal Evaluation (25 marks for Internal test and 15 marks for assignments/ field work) and 60 marks for the End-Examination.

6.2 Each Internal Test question paper shall contain 5 questions, of which the First question is compulsory and three questions are to be answered from the remaining four. Compulsory question carries 10 marks (It contains 5 short answer questions). The remaining 3 questions carry 5 marks each. Each question shall have a,b,c.... parts. The duration of internal test will be for 2 hours. First test to be conducted in 3 units in the middle of the semester and second test to be conducted in the remaining 3 units of each subject at end the semester. There shall be two assignments in each subject (problem based/ field work) for the award of 15 marks so that internal component (marks) will be 40 marks (25 marks for internal test+15 marks for assignments / field work). For awarding of 25 Internal marks the performance of the student in two internal examinations conducted will be considered by giving a weightage of 0.75 for the better score and 0.25 for the other score.

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6.3 The End Examination question paper will have 7 questions and students have to answer 5 questions. However, the first question is compulsory and it consists of 6 short answer questions, each carrying 2 marks. The next 4 questions are to be answered from the remaining 6 questions and each carries 12 marks. Each 12 marks question shall have a, b, c . parts. For all PG (M.Tech, MBA and MCA) courses for all the subjects the valuation of answer scripts will be done by external Examiners form the other institute and as well as Internal Examiners of the institute who are teaching the subject. If the difference of marks in external and Internal evaluation is more than 15% of external marks, then the papers will be sent to third Examiner for valuation purpose. Then average of closely spaced marks will be considered as final marks in that subject. List of Examiners for external evaluation will be finalized by CE, with the approval of the principal.

6.4 Elective subjects will commence from 1st semester. Out of the electives offered in 2nd / 3rd semester, one elective will be MOOC / Electives offered by the department. Any student who is interested can opt for the MOOC/ Electives offered by the department and acquire the required credits. Even if the student opts MOOC, he has to write two internal tests besides the end examination conducted by the institute like other subjects. However, he has to obtain the certificate from the organization in which he has registered. Any MOOC selected by the student should be of more than 45 hours duration and also from the reputed organization. Attendance of the student who has opted for MOOC will be taken from the remaining subjects and labs only in that semester while finalizing the attendance for fulfilling the minimum requirements of attendance for promotion to next semester. Attendance will not be recorded for MOOC. Where ever MOOC is opted by the student, the evaluation procedure will be similar to any subject offered by the department.

6.5 For practical subjects, 40 marks shall be for the End Semester Examinations and 60 marks will be for internal evaluation based on the day-to-day performance. Laboratory examination for M.Tech.. Course shall be conducted with two Examiners, one of them being Laboratory Class Teacher and second Examiner shall be outside from the institute (External examiner).

6.6 Student has to undergo a Continuous Comprehensive Evaluation pertaining to his specialization which carries 100 marks out of which 40 marks for internal and 60 marks for external examination in each semester. The internal marks shall be awarded based on performance of the student evaluated weekly by the departmental committee. He has to secure 50% marks to obtain required credits. Continuous Comprehensive Evaluation (CCE) end examination will be conducted at the end of 1st, 2nd and 3rd semester by the committee consisting of HOD, senior faculty member and external Examiner from outside the institute. For this, HOD of the Department shall submit a panel of 4 Examiners, who are eminent in that field. One from the panel will be selected by the principal of the institute as external Examiner for comprehensive viva.

6.7 For Technical Seminar 50 marks shall be for internal evaluation. The candidate has to secure a minimum of 25 marks to be declared successful. The assessment will be made by a board consisting of HOD and two internal experts at the end of 4th semester.

6.8 The 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 End Examination and a minimum aggregate of 50% of the total marks in the End Examination and Internal evaluation taken together. In case if there is no End Examination in subject/practical/seminar/CCE etc. student has to get minimum of 50% in the Internal Examination alone.

6.9 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.0), he has to reappear for the Semester Examination either supplementary or regular in that subject, or repeat the course when next offered or do any other specified subject as may be required.

7.0 Re-registration for improvement of Internal marks:

Following are the conditions to avail the benefit of improvement of internal marks.

7.1 The candidate should have completed the course work and obtained examinations results for 1st, 2nd and 3rd semesters.

7.2 He should have passed all the subjects for which the internal marks secured are more than 50%.

7.3 Out of the subjects the candidate has failed in the examination due to Internal marks secured being less than 50%, the candidate shall be given one chance for each Theory subject and for a maximum of three Theory subjects for Improvement of Internal marks.

7.4 The candidate has to re-register for the chosen subjects and fulfil the academic requirements as and when they are offered.

7.5 For each subject, the candidate has to pay a fee equivalent to one tenth of the semester tuition fee and the amount is to be remitted in the form of D. D. in favour of the Principal, RGMCET payable at RGMCET, Nandyal branch along with the requisition through the HOD of the respective Department.

7.6 In case of availing the Improvement of Internal marks, the internal marks as well as the End Examinations marks secured in the previous attempt (s) for the re-registered subjects stand cancelled.

8.0 Evaluation of Project / Dissertation work :

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

8.1 Registration of Project work: The candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses.

8.2 An Internal Department Committee (I.D.C.) consisting of HOD, Supervisor and One Internal senior expert shall monitor the progress of the project work.

8.3 The work on the project shall be initiated in the penultimate semester and continued in the final semester. The duration of the project is for two semesters. The candidate can submit Project thesis with the approval of I.D.C. after 36 weeks from the date of registration at the earliest. Extension of time within the total permissible limit for completing the programme is to be obtained from the Head of the Institution.

8.4 The student must submit status report at least in three different phases during the project work period. These reports must be approved by the I.D.C. before submission of the Project Report.

8.5 The candidate shall be allowed to submit the thesis/dissertation only after passing in all the prescribed subjects (both theory and practical) and then take viva voce examination of the project. The viva - voce examination may be conducted once in two months for all the candidates submitted during that period.

8.6 Three copies of the Thesis/Dissertation certified in the prescribed form by the supervisor & HOD shall be submitted to the institute.

8.7 The Department shall submit a panel of 4 experts for a maximum of 4 students at a time. However, the thesis/dissertation will be adjudicated by the board consists of HOD, concerned supervisor and one external Examiner from other institute nominated by the principal from a panel of Examiners submitted by the Department HOD to the Controller of Examinations.

8.8 If the report of the board is favourable in viva voce examination, the board shall jointly report candidates work as:

1. Good
2. Satisfactory
3. Not satisfactory

If the report of the viva voce is not satisfactory the candidate will retake the viva voce examination after three months. If he fails to get a satisfactory report at the second viva voce examination he will not be eligible for the award of the degree unless the candidate is permitted to revise and resubmit the thesis.

9.0 Award of Degree and Class:

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

Table 3: Award of division/Class

Class Awarded	% of marks to be secured	Division/ Class	CGPA	CGPA obtained from

First Class with Distinction	70% and above	First Class With Distinction	≥ 7.5	the 48 Credits. (Excluding Project Phase-I and Phase-II credits)
First Class	Below 70% but not less than 60%	First Class	≥ 6.5 *and* < 7.5	
Second Class	Below 60% but not less than 50%	Second Class	≥ 5.5 *and* < 6.5	

10.0 ***Grading:***

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student falls.

Table 4: Conversion into Grades and Grade points assigned

Range in which the % of marks in the subject fall	Grade	Grade point Assigned	Performance	Performance in Project work
90 to 100	O	10	Outstanding	Performance in project will be reported as i) Good ii) Satisfactory iii) Un Satisfactory. The credits obtained in Project will not be considered for the award of Class.
80 to 89.9	A+	09	Excellent	
70 to 79.9	A	08	Very good	
60 to 69.9	B+	07	good	
50 to 59.9	B	06	Pass	
<50	F	00	Fail	
Ab	AB	00	Fail	

10.1 Requirement for clearing any subject: The students have to obtain a minimum of 40% in End Examination and they have to score minimum of 50% marks from Internal and external exam marks put together to clear the subject. Otherwise they will be awarded fail grade.

10.2 F is considered as a fail grade indicating that the student has to reappear for the end supplementary examination in that subject and obtain a non-fail grade for clearing that subject.

10.3 To become eligible for the award of degree the student must obtain a minimum CGPA of 5.5.

11.0 Supplementary Examinations:

Apart from the regular End Examinations the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examination per day. The student is not permitted to improve his performance in any subject in which he has obtained pass grade.

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12.0 *Grade Point Average (GPA) and Cumulative Grade Point Average(CGPA)*

The Grade Point Average (GPA) for each semester and Cumulative Grade Point Average (CGPA) up to any semester are calculated as follows:

i) Semester Grade Point Average will be computed as follows:

$$GPA = \frac{\sum_1^n C_i \times GP_i}{\sum_1^n C_i}$$

Where, n is the number of subjects in that semester. C_i is Credits for the subjects. GP_i is the grade point obtained for the subject and the summation is over all the subjects in that semester.

ii) A Cumulative Grade Point Average (CGPA) will be computed for every student at the end of each semester. The CGPA would give the cumulative performance of The student from the first semester up to the end of the semester to which it refers and is calculated as follows

$$CGPA = \frac{\sum_1^m GPA_j \times TC_i}{\sum_1^m TC_j}$$

Where 'm' is the number of semester under consideration. TC_j the total number of credits for a j^{th} semester and GPA_j is the Grade Point Average of the j^{th} semester. Both GPA and CGPA will be rounded off to the second digit after decimal and recorded as such.

While computing the GPA / CGPA the subjects in which the student is awarded zero grade points will also be included.

13.0 Grade Sheet:

A grade sheet (Memorandum) will be issued to each student indicating his performance in all subjects of that semester in the form of grades and also indicating the GPA and CGPA.

14.0 Transcripts:

After successful completion of prerequisite credits for the award of degree a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

15.0 Minimum Instruction Days:

The minimum instruction days for each semester shall be 95 clear instruction days excluding the days allotted for tests/examinations and preparation holidays declared if any.

16.0 Amendment of Regulations:

The college may, from time to time, revise, amend or change the regulations, scheme of examinations and syllabi. However the academic regulations of any student will be same throughout the course of study in which the student has been admitted.

17.0 Transfers

There shall be no branch transfers after the completion of admission process.

18.0 Withholding of results:

If the candidate has not paid any dues to the institute or if any case of in-discipline is pending against him, the result of the candidate will be withheld and he will not be allowed for the next semester. The issue of the degree is liable to be withheld in such cases.

19.0 Transitory Regulations:

Candidates who have discontinued or have been detained for want of attendance are eligible for admission to the same or equivalent subjects as and when subjects are offered, subject to 2.0 and 5.0.

20.0 Rules of Discipline:

20.1 Any attempt by any student to influence the teachers, Examiners, faculty and staff of Examination section for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.

20.2 When the student absents himself, he is treated as to have appeared and obtained zero marks in that subject (s) and grading is done accordingly.

20.3 When the performance of the student in any subject (s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject (s).

20.4 When the student's answer book is confiscated for any kind of attempted or suspected malpractice, the decision of the Chief Superintendent is final.

21.0 General:

21.1 The Academic Regulations should be read as a whole for the purpose of any interpretation.

21.2 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the College Academic Council is final.

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

21.4 *Where the w*ords "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

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I Year M.Tech I SEMESTER

COURSE STRUCTURE

Subject Code	Subject	Theory	Practical	Credits	Scheme Of Evaluation		
					Internal Marks	External Marks	Total
Core 1	Mathematical Foundations of Computer Science	3		3	40	60	100
Core 2	Advanced Data Structures and Algorithms	3		3	40	60	100
Program Specific Elective1		3		3	40	60	100
	Operating Systems						
	Database Management Systems						
	Web Technologies						
Program Specific Elective2		3		3	40	60	100
	Distributed Systems						
	Machine Learning						
	Software Engineering						
	Research Methodology & IPR	3		3	40	60	100
Audit	Constitution of India						
Lab 1	Advanced Data Structures and Algorithms Lab	0	3	1.5	40	60	100
Lab 2	OS/DBMS/WT Lab	0	3	1.5	40	60	100
CCE	Continuous Comprehensive Evaluation		4	2	40	60	100
		15	10	20	320	480	800

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I Year M.Tech II SEMESTER

Subject Code	Subject	Theory	Practical	Credits	Scheme Of Evaluation		
					Internal Marks	External Marks	Total
Core 3	Object Oriented Analysis and Design	3		3	40	60	100
Core 4	Data Warehousing and Data Mining	3		3	40	60	100
Program Specific Elective3		3		3	40	60	100
	Soft Computing						
	Mobile Application Development						
	Advanced Computer Architecture						
Program Specific Elective4/MOOCS		3		3	40	60	100
	Computer Networks						
	Distributed Databases						
	Software Project Management						
Audit	Stress Management by Yoga	3					
Lab 3	Object Oriented Analysis and Design Lab	0	3	1.5	40	60	100
Lab 4	Data Warehousing and Data Mining Lab	0	3	1.5	40	60	100
	Mini Project	0	3	1.5	40	60	100
CCE	Continuous Comprehensive Evaluation		4	2	40	60	100
		15	13	18.5	320	480	800

COURSE STRUCTURE

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II Year M.Tech I SEMESTER

Subject Code	Subject	Theory	Practical	Credits	Scheme Of Evaluation		
					Internal Marks	External Marks	Total
Program Specific Elective5		3		3	40	60	100
	Cloud Computing						
	Distributed Systems						
	Big Data Analytics						
Open Elective -1 / MOOCs		3		3	40	60	100
	Human Computer Interaction						
	Network Security & Cryptography						
	Artificial Intelligence						
CCE	Continuous Comprehensive Evaluation		4	2	40	60	100
	Main Project Phase -1		18	9			
	Total	6	22	17	120	180	300

COURSE STRUCTURE

II YEAR M.Tech II SEMESTER

COURSE STRUCTURE

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Subject Code	Subject	Theory	Practical	Credits	Scheme Of Evaluation		
					Internal Marks	External Marks	Total
	Technical Seminar			1.5	50		50
	Main Project Phase II		26	13	-	-	-
	Total			14.5	50		50

I Year M.Tech(CS) - I Sem **T C**

3 3

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

OBJECTIVES:

- To teach students notations used in the discrete mathematics associated with computer science and engineering.
- To teach the rudiments of elementary mathematical reasoning (elementary proofs; proofs by induction).
- To prepare students for the theoretical parts of all further courses in CSE.
- To study logic and Boolean algebra from a mathematical perspective, but relating it to computer engineering applications.
- To introduce basic set-theoretical notions: relations, functions, graphs, equivalence relations and orderings.
- To relate these notions to applications in CSE.

OUTCOMES:

- Understand truth tables, the concept of logical equivalence and its relationship to equivalent logic circuits and Boolean functions. Know some Boolean laws of equivalence. Extend this to predicate calculus and in predicate calculus using quantifiers.
- Be able to express English assertions in propositional calculus and in predicate calculus using quantifiers.
- Understand and use the basics of set theory notation, Boolean operations on sets Be able to work with functions.
- Be able to carry out simple direct and indirect proofs about domains like the integers and the real numbers, using quantified statements about these domains. Be able to do simple proofs by mathematical induction.
- Be able to understand and write recursive definitions, in mathematical form.

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- Understand binary and n-ary relations and their applications. Know the major types of binary relations on a set. Be able to use graphs as representing relations, algorithms for relations based on graphs or matrices (e.g. transitive closure).

UNIT-I

Mathematical Logic: Statements and notations, Connectives, Well formed formulas, Truth Tables, tautology, equivalence implication, Normal forms.

UNIT-II

Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Quantifiers.

UNIT-III

Relations: Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Hasse diagram, Lattice and its Properties,

Functions: Inverse Function, Composition of functions, Pigeonhole principles and its application.

UNIT-IV

Algebraic structures: Algebraic systems examples and general properties, Semi groups and monads, groups, sub groups, homomorphism, Isomorphism.

UNIT-V

Elementary Combinatorics: Basis of counting, Enumerating Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial & Multinomial theorems, the principles of Inclusion – Exclusion.

UNIT-VI

Graph Theory: Representation of Graph, DFS, BFS, Planar Graphs.

Graph Theory Applications: Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers

TEXT BOOKS:

1. Discrete Mathematical Structures with Application to Computer Science, Tremblay, Manohar McGraw Hill Publication (for unit-1 to unit-4).
2. Discrete Mathematics for Computer Scientists & Mathematicians, 2/e, J.L.Mott, A. Kandel, T.P. Baker, PHI (for unit-5 to unit-8).

REFERENCE:

1. Discrete and Combinatorial Mathematics- An Applied Introduction, Ralph. P.Grimaldi,5/e, Pearson Education.
2. Mathematical foundation of computer science by Dr.D.S.Chandra sekharaiah, prism publication.

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I Year M.Tech(CS) - I Sem **T C**
3 3

ADVANCED DATA STRUCTURES AND ALGORITHMS

OBJECTIVES:

- This course explores data structures, and the practical problems of implementing those structures in real programming languages and environments
- How the field of algorithms are developed.
- Significance of algorithm efficiency.
- Significance and importance of program correctness.

OUTCOMES:

- Explain the basic concepts of time and space complexity, divide-and-conquer strategy, dynamic programming, greedy algorithms, amortized analysis.
- Describe the methodologies of how to analyze an algorithm.
- Identify the complexity of problems.
- Solve a problem using an algorithm and evaluate its correctness.
- Formulate the time-complexity analysis for an algorithm.

UNIT I

Trees and Graphs: Introduction, Definition and Basic terminologies of trees and binary trees, Representation of trees and Binary trees, Binary tree Traversals, Threaded binary trees, Graphs-basic concepts, representation and traversals.

UNIT II

Binary Search Trees, AVL Trees and B Trees

Introduction, Binary Search Trees: Definition, Operations and applications. AVL Trees: Definition, Operations and applications. B Trees: Definition, Operations and applications.

UNIT III

Red – Black Trees, Splay Trees and Hash Tables

Red – Black Trees, Splay Trees and its applications. Hash Tables: Introduction, Hash Tables, Hash Functions and its applications.

UNIT IV

Algorithm Analysis

Efficiency of algorithms, Apriori Analysis, Asymptotic Notations, Time complexity of an algorithm using O notation, Polynomial Vs. Exponential Algorithms, Average, Best, and Worst Case Complexities, Analyzing Recursive Programs.

UNIT V

Divide – and – Conquer & Greedy Method

General Method, Binary Search, Finding Maximum and Minimum, Quick Sort, Merge sort, Stassen's Matrix Multiplication, Greedy Method- General Method, Minimum Cost Spanning Trees, Single Source Shortest Path.

UNIT VI

Dynamic Programming and Back Tracking

General Method, All Pairs Shortest Path, Single Source Shortest Path, 0 / 1 Knapsack problem, Reliability Design, Traveling Sales Person's Problem. **Back Tracking:** General Method, 8 – Queen's Problem, Graph Coloring.

TEXT BOOKS:

1. Data Structures and Algorithms by G.A.V. Pai, 2009, TMH.
2. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, 2nd edition, University Press.

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REFERENCE BOOKS:

1. Classic Data Structures by D. Samanta, 2005, PHI
2. Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.
3. Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG.
4. Design and Analysis of Algorithms by E. Horowitz, S. Sahani, 3rd Edition, Galgotia.
5. Data Structures and Algorithms in C++ by Drozdek 2nd Edition, Thomson.

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I Year M.Tech(CS) - I Sem **T C**
3 3

OPERATING SYSTEMS
(Program Specific Elective -1)

OBJECTIVES:

- This course deals with functions, structures and history of operating systems.
- To understand the design issues associated with operating systems.
- To understand various process management concepts including scheduling, synchronization, deadlocks.
- To be familiar with multithreading and the concepts of memory management including virtual memory.
- To understand the issues related to file system interface and implementation, disk management with protection and security mechanisms. Some example operating systems (UNIX, Windows, Solaris etc.)

OUTCOMES:

- At the end of the course the students knows the need and requirement of an interface between Man and Machine.
- To enable them to identify the difference between the system software and the application software and their design requirements.
- Students will be able to relate the features of operating systems and the fundamental theory associated with process, memory and file management components of different operating systems.
- Students will learn about and understand theoretical concepts and programming constructs used for the operation of modern operating systems.
- Students will gain practical experience with software tools available in modern operating systems such as semaphores, system calls, sockets and threads.

UNIT I

Operating Systems Overview: What operating Systems do, Computer System Organization, Computer System Architecture, and Operating-System Operations.

Operating systems structures: Operating system services, Systems calls, Types of System calls, System programs, operating system structure, Operating system generation.

UNIT II

Process Management: Process concept, Process Scheduling, Interprocess communication.

Multithreaded Programming: Overview, Multithreaded Models.

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling algorithms.

UNIT III

Synchronization: Background, The critical-section problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic problems of synchronization, Monitors.

Principles of deadlock: System model, Deadlock characterization, Deadlock prevention, Detection and Avoidance, Recovery form deadlock.

UNIT IV

Memory Management: Background**,** Swapping, Contiguous memory allocation, Paging, Structure of the page table, segmentation.

Virtual memory Management: Background, Demand paging, Page-replacement (Basic Page replacement, FIFO, Optimal, LRU), Allocation of frames, Thrashing.

UNIT V

File system: File concept, Access Methods, Directory and Disk Structure, File sharing, Protection.

Implementing File Systems: File system structure, File system implementation, Directory implementation, Allocation methods, and Free-space management.

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UNIT VI

Secondary Storage Structure: Overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, Disk Management, Swap-space management, RAID structure, stable-storage implementation, Tertiary storage structure.

TEXT BOOKS:

1. Operating System Concepts, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth edition, John Wiley.
2. Operating Systems, A Concept based Approach- D.M.Dhamdhere, Second Edition, TMH.

REFERENCES:

1. Operating Systems: Internals and Design Principles, Stallings, Sixth Edition–2009, Pearson Education.

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DATABASE MANAGEMENT SYSTEMS
(Program Specific Elective -1)

OBJECTIVES:

- Advantages applications of DBMS and Database system structure.
- Schema design: ER model and conceptual design.
- Relational model and SQL basics.
- Relational algebra and Query optimization.
- Storage and efficient retrieval of data: various indexing techniques.

OUTCOMES:

- Students will learn about the need for DBMS, the largeness of the data and why it gives rise to steam oriented processing and strategies and are at higher level than general purpose programming language such as JAVA.
- Students will learn about storage and efficient retrieval of large Information via algebraic query optimization and the use of indexing.
- Students will also learn basics of SQL and about primary key concepts and foreign key concepts. They will also learn about data manipulation (insertions deletions & updation) and triggers.
- Students will learn about functional dependency and the need for schema refinement (normalization) to remove redundancy of data.
- Students will also learn about transaction management concurrency Control and crash recovery.

UNIT – I

Data base System Applications, data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor – History of Data base Systems. Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model

UNIT – II

Relational Model : Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.

Relational Algebra and Calculus: Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra Queries – Relational calculus – Tuple relational Calculus – Domain relational calculus.

UNIT – III

Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOTR – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT – IV

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Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – forth Normal Form.

UNIT – V

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

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

UNIT – VI

Overview of Storage and Indexing : Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations. **Storing data: Disks and Files :** The Memory Hierarchy – Redundant Arrays of Independent – Disks – Disk Space Management – Buffer Manager – Files of records – Page Formats – record formats

.

TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw-Hill 3rd Edition
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, IV edition.

REFERENCES:

1. Introduction to Database Systems, By ITL Education Solutions Ltd.(Pearson Publisher)
2. Data base Systems design, Implementation, and Management, Rob & Coronel 5th Edition. Thomson
3. Data base Management System, Elmasri Navrate Pearson Education
4. Data base Management System Mathew Leon, Leon Vikas.
5. Data base Systems, Connoley Pearson education.

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WEB TECHNOLOGIES
(Program Specific Elective-1)

OBJECTIVES:

- This course demonstrates an in-depth understanding of the Web technologies necessary for business application design and development. The course covers client side scripting like HTML, JavaScript and server side scripting like servlets, JSPs. And also XML and web servers and database interfacing.

OUTCOMES:

- Development of a business application.
- Implementation of given client side and server side technologies.
- Design and develop static and dynamic web pages.
- Validate web page data with database data.
- Knowledge on Web Application Development.

Unit I:
HTML Common tags:
List, Tables, images, forms, Frames; Cascading Style sheets; Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script.

Unit II:
XML:
Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX

Unit III:
Java Beans:
Introduction to Java Beans, Advantages of Java Beans, BDK Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizes, Java Beans API.

Unit IV:
Web servers & Servlets:
Tomcat Server installation & Testing.
Introduction to Servelets:
Lifecycle of a Serverlet, JSDK, The Servelet API, The javax.servelet Package, Reading Servelet parameters, Reading initialization parameters, The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues.

Unit V:
Introduction to JSP: The Problem with Servelet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC architecture.
JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data.

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Unit VI:

Database Access: Database Access, Database Programming using JDBC Studying Javax.sql.* package Accessing a Database from a JSP Page Application – Specific Database Actions Deploying JAVA Beans in a JSP Page

TEXT BOOKS:

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech (UNIT 1, 2)
2. The complete Reference Java 2 Fifth Edition, Patrick Naughton and Herbert Schildt., TMH (Chapters: 25) (UNIT 2,3)
3. Java Server Pages –Hans Bergsten, SPD O'Reilly (UNITs 3,4,5)

REFERENCE BOOKS:

1. Programming world wide web-Sebesta, Pearson Core SERVLETS ANDJAVASERVER PAGES VOLUME 1: CORE TECHNOLOGIES , Marty Hall and Larry Brown Pearson

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DISTRIBUTED SYSTEMS
(Program Specific Elective – 2)

OBJECTIVES:

- Present the principles underlying the functioning of distributed systems;
- Create an awareness of the major technical challenges in distributed systems design and implementation;
- Expose students to modern and classic technology used in distributed systems and their software;
- Provide experience in the implementation of typical algorithms used in distributed systems

OUTCOMES:

- 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;
- 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;
- Recognise 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;
- Design a distributed system that fulfils requirements with regards to key distributed systems properties (such as scalability, transparency, etc.), be able to recognise when this is not possible, and explain why;

UNIT-I
Introducton of Distributed System: Goals, Hardware Concepts, Software Concepts, the Client-Server Model.

UNIT-II
Communication: Remote Procedure Call, Remote Object Invocation, Message Oriented Communication, Stream-Oriented Communication.

UNIT-III
Processes: Threads, Clients, Servers, Code Migration, Software Agents. NAMING: Naming Entities, Locating Mobile Entities.

UNIT-IV
Synchronization: Clock Synchronization, Logical Clocks, Global State, Election Algorithms, Mutual Exclusion, Distributed Transactions.

UNIT-V
Consistency And Replication: Introduction, Data-Centric Consistency Models, Client Centric Consistency Models, Distribution Protocols, Consistency Protocols, Examples.

UNIT-VI
Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery.

TEXT BOOKS

1. Andrew S. Tanenbaum, Maarten Van Steen. Distributed Systems – Principles and Paradigms 2/e, PHI, 2004.

REFERENCE BOOKS

1. Pradeep K. Sinha, “Distributed Operating Systems Concepts and Design”, PHI 2002.
2. Randy Chow Theodore Johnson, “Distributed Operating Systems and Algorithm Analysis”, PEA, 2009.
3. George Couloris, Jean Dollimore, Tim Kind berg, “Distributed Systems Concepts and Design”, 3/e, PEA, 2002.

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MACHINE LEARNING

(Program Specific Elective – 2)

OBJECTIVES:

The main objective of this course is to provide students

- Basic knowledge about the key algorithms and theory that form the foundation of machine learning and computational intelligence
- To get idea of Bayesian Decision theory
- To get ida of Componet analysis and various stochastic methods.

OUT COMES:

Upon completion of the course students should able to learn:

- Understand the machine learning perception.
- about the mathematical background of bayesian decision theory.
- Understand the maximum likelihood estimation
- understand about theoritical insights of supervised and unsupervised learning.
- About the techniques of component analysis
- about different stochastic methods.

UNIT – I

Introduction: Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation.

UNIT – II

Bayesian Decision Theory: Introduction, continuous features – two categories classifications, minimum error-rate classification- zero–one loss function, classifiers, discriminant functions, and decision surfaces.

UNIT – III

Maximum likelihood and Bayesian parameter estimation: Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case.

UNIT – IV

Un-supervised learning and clustering: Introduction, mixture densities and identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Data description and clustering – similarity measures, criteria function for clustering.

UNIT – V

Component analysis: Principal component analysis, non-linear component analysis; Low dimensional representations and multi-dimensional scaling.

UNIT-VI

Stochastic methods: Introduction, Stocastic search, Boltzmann learning

TEXT BOOKS:

1. **"Pattern classifications"**, Richard O. Duda, Peter E. Hart, David G. Stroke. Wiley student edition, Second Edition.

REFERENCE BOOKS:

1. **"Pattern Recognition and Image Analysis"** – Earl Gose, Richard John baugh, Steve Jost.
2. **"Introduction to Machine Learning"** by Ethem Alpaydin, PHI 2nd Edition.

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SOFTWARE ENGINEERING
(Program Specific Elective 2)

OBJECTIVES:

- To understand Software development as a process.
- Various software process models and system models.
- Various software designs: Architectural, object oriented , user interface etc.
- Software testing methodologies overview: various testing techniques including white box testing black box testing regression testing etc.
- Software quality: metrics, risk management quality assurance etc.

OUTCOMES:

- Students will learn to work as a team and to focus on getting working project done on time with each student being held accountable for their part of the project.
- Student will learn about risk management and quick prototyping de-risk project management.
- Students will learn about and go through the software life cycle with emphasis on different process requirements design and implementation phases.
- Students will learn about software process models and hoe to choose an Appropriate model for their project will learn about risk management and quick prototyping to de-risk projects.

UNIT I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths.

A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns.

UNIT II

Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

System models: Context Models, Behavioral models, Object models.

UNIT III

Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, the software requirements document.

UNIT IV

Design Engineering: Design process and Design quality, Design concepts.

Creating an architectural design: Software architecture, Data design, Architectural styles and patterns, Architectural Design.

UNIT V

Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

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Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing.

UNIT VI

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management : Quality concepts, Software quality assurance, Software Reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition.McGrawHill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson education.

REFERENCES:

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
3. Systems Analysis and Design- Shely Cashman Rosenblatt, Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.

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3 3

Research Methodology & IPR

Course Objectives:

- The student would be able to understand the research methodology basics and its application.
- To develop orientation towards research related activities and ethical research recognizing the ensuing knowledge as property.
- To create consciousness for Intellectual Property Rights and its constituents.
- To understand the procedures of attaining patents in domestic and international scenario.
- To update on the contemporary issues in Intellectual Property rights

Course Outcomes:

- The students will be able to demonstrate their ability in understanding and formulation of research problem.
- To understand plagiarism and follow research ethics
- To analyze research related information, able to interpret and write research report.
- To understand the role of internet in IPR and its impact on ideas, concept, and creativity.
- Understand current and emerging issues related to IP protection and its impact on research and development which ultimately leads to economic growth and social benefits.

Syllabus Contents:

Unit 1: Introduction to Research methodology, Research problem, Scope and objectives of research problem, Research process, Research Design Types of research , Research Approaches

Unit 2: Effective literature review approaches, Data collection, analysis, interpretation, Tools and techniques of research analysis, Plagiarism analysis, Research ethics.

Unit 3: Effective technical writing, Report writing, Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

Unit 4: Nature of Intellectual Property: Patents, Designs, Trademark and Copyright, Process of Patenting and Development, Technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents.

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications, Patenting under Patent Cooperation Treaty (PCT)

Unit 6: Contemporary issues in IPR, IPR of Biological Systems, Computer Software etc. Traditional knowledge of IPR, Role of Institutions in IPR, The Impact of Internet on IPR, India`s New National IP Policy – Govt. of India step towards promoting IPR – Govt. Schemes in IPR – IPR in current scenario with case studies.

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Reference Books:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction" Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
- Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited.
- Neeraj, P., & Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited.
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007. 5. Mayall , "Industrial Design", McGraw Hill, 1992

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I Year M.Tech(CS) - I Sem **P C**

2 1

Advanced Data Structures & Algorithms Lab

OBJECTIVES:

- Learn how to implement some useful data structures.
- Understand the effect of data structures on an algorithm's complexity.
- To develop skills to design and analyze simple linear data structures
- Create and delete database schemas and execute SQL queries
- Make Use of PL/SQL Variables.

OUTCOMES:

- Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
- At the end of this lab session, the student will be able to design and analyze the time and space efficiency of the data structure
- Have practical knowledge on the application of data structures
- Implement the given schema on a relational DBMS.
- Design, develop, and maintain Oracle Database Objects.

1). Write a C/C++ program to implement Binary Tree Traversals.

2). Write a C/C++ program to implement AVL tree.

3). Write a C/C++ program to implement Binary Search Tree.

4). Write a C/C++ program to implement Quick Sort method

5). Write a C/C++ program to implement Minimum cost spanning trees.

6). Write a C/C++ program to implement all pairs Shortest Path.

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3 **2**

WEB TECHNOLOGIES LAB

Objective:

- To create a fully functional website with mvc architecture.
- To develop an online Book store using we can sell books (Ex amazon .com).

Hardware and Software required:

- A working computer system with either Windows or Linux.
- A web browser either IE or firefox.
- Tomcat web server and Apache web server
- XML editor like Altova Xml-spy [www.Altova.com/**XML**Spy – free] , Stylus studio , etc.,
- A database either MySQL or Oracle.

1. Write HTML to implement lists.
2. Write HTML to navigate from one page to another and to navigate within the page.
3. Write HTML to display time-table in a web page.
4. Write HTML for registration form.
5. Write HTML for login form.
6. Write HTML to develop home page using frames.
7. Write HTML to implement cascading style sheets.
8. Write java script to validate login form.
9. Write java script to validate registration form.
10. Write a simple XML for customer information of a super market.
11. Validate XML using Document Type Definition.
12. Write an XSL to display library data held by an XML.
13. Write an XML for student data. Retrieve second student data and display it using DOM.
14. Develop colors java bean using BDK.

Install tomcat web server. Write a simple servlet that displays a message.

15. Write a servlet that reads input data from request and displays them as response.
16. Write a servlet that handles HTTP GET & HTTP POST.
17. Write a servlet that creates and retrieves cookie.
18. Write a servlet that implements a session.
19. Write a JSP to implement cookie.
20. Write a servlet that retrieves data base data and displays in a web page.
21. Write a servlet that validates login form with data base data.

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I Year M.Tech(CS) – II Sem	**T**	**C**
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OBJECT ORIENTED ANALYSIS AND DESIGN

OBJECTIVES:

- Describe and explain concepts and principles of object oriented software development
- Describe and explain fundamental theories, techniques and methods in software engineering
- Master basic object oriented modelling principles
- Describe and explain basic concepts and constructs in the Java programming language
- Implement programs in the Java programming language

OUTCOMES:

- Analyze and model requirements and develop software using object-oriented analysis and design.
- Express object models in UML
- Use CASE tools for software design.
- Work as a member of a software development team.

UNIT I

Introduction to UML:

Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT II

Basic Structural Modeling:

Classes, Relationships, common Mechanisms, and diagrams.

Advanced Structural Modeling:

Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

UNIT III

Class & Object Diagrams:

Terms, concepts, modeling techniques for Class & Object Diagrams.

UNIT IV

Basic Behavioral Modeling-I:

Interactions, Interaction diagrams.

Basic Behavioral Modeling-II:

Use cases, Use case Diagrams, Activity Diagrams.

UNIT V

Advanced Behavioral Modeling:

Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT VI

Architectural Modeling:

Component, Deployment, Component diagrams and Deployment diagrams.

Case Study: The Unified Library application.

TEXT BOOKS:

1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson

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Education.
2. UML 2 Toolkit, Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY-Dreamtech India Pvt. Ltd.

REFERENCES:

1. Fundamentals of Object Oriented Design in UML, Meilir Page-Jones, Pearson Education.
2. Modeling Software Systems Using UML2, Pascal Roques, WILEY- Dreamtech India Pvt. Ltd.
3. Object Oriented Analysis and Design, Atul Kahate, The McGraw-Hill Companies.
4. Object-Oriented Analysis and Design with the Unified Process, John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.
5. Learning UML 2.0, Russ Miles and Kim Hamilton, O'Reilly, SPD.
6. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.
7. UML and C++, R.C.Lee and W.M.Tepfenhart, PHI.
8. Object Oriented Analysis,Design and Implementation, B.Dathan and S.Ramnath, Universities Press.
9. OODesign with UML and Java, K.Barclay, J.Savage, Elsevier.
10. Mark Priestley: Practical Object-Oriented Design with UML, TMH.

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I Year M.Tech(CS) - IISem **T C**
3 3

DATAWAEHOUSING AND DATA MINING

OBJECTIVES:

- With the basic data warehousing and data mining concepts.
- To learn mining rules in large databases.
- To get idea on clustering analysis.
- Applications that can enable them to set up and manage an industrial data warehousing and data mining system.
- To learn about OLTP and OLAP systems.

OUTCOMES:

- Ability to do Conceptual, Logical, and Physical design of Data Warehouses.
- Familiarity with Requirements Engineering for Data Warehouses.
- OLAP applications and OLAP deployment.
- Have a good knowledge of the fundamental concepts that provide the foundation of data mining.
- Learn broad classes of data mining technologies.

UNIT – I
Introduction:
Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining task primitives, Integration of data mining system with Data base or Data Warehouse system, Major issues in Data Mining.

UNIT – II
Data Warehouse and OLAP Technology:
Overview of Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining.

UNIT – III
Data Preprocessing:
Need of preprocessing the data, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

UNIT – IV
Mining Frequent patterns, Associations, and Correlations:
Basic Concepts, Efficient and Scalable Frequent Item set Mining methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

UNIT – V
Classification
Overview of Classification and Prediction, Issues Regarding Classification and Prediction, Bayesian Classification, Classification by Decision Tree Induction, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Lazy Learners: k-Nearest-Neighbor Classifiers, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Ensemble Methods- Increasing the Accuracy.

UNIT – VI
Cluster Analysis I:
Overview of Cluster Analysis, Types of data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods.

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TEXT BOOKS:

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER Harcourt India, second edition.

REFERENCES:

1. Data Mining Introductory and advanced topics–MARGARET H DUNHAM, PEARSON EDUCATION
2. Data Mining Techniques – ARUN K PUJARI, University Press.
3. Data Warehousing in the Real World – SAM ANAHORY & DENNIS MURRAY. Pearson Edition Asia.
4. Data Warehousing Fundamentals – PAULRAJ PONNAIAH WILEY STUDENT EDITION
5. The Data Warehouse Life cycle Tool kit – RALPH KIMBALL WILEY STUDENT EDITION.

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3 3

Soft Computing
(Program Specific Elective-3)

OBJECTIVES:

- Soft computing covers non-traditional technologies or approaches for solving hard real-world problems. Content of course, in accordance with meaning of its name, is as follow: Tolerance of imprecision and uncertainty as the main attributes of soft computing theories. Neural networks. Fuzzy logic.

OUTCOMES:

- The student will be able to acquire knowledge of soft computing theories fundamentals.
- they will be able to design program systems using approaches of these theories for solving various real-world problems.
- To demonstrate knowledge by applying soft computing techniques to various applications.

UNIT I

Introduction to Intelligent Systems and Soft Computing: Introduction, Intelligent systems, Knowledge-based systems, Knowledge representation and processing, Soft computing

UNIT II

Fundamentals of Fuzzy Logic Systems & Fuzzy Logic Control: Fuzzy sets, Fuzzy logic operations, Generalized fuzzy logic operations, Implication (if-then), Some definitions, Fuzziness and fuzzy solutions, Fuzzy relations, Composition and inference, Considerations of fuzzy decision-making. Basics of fuzzy control, Fuzzy control architectures.

UNIT III

Fundamentals of artificial neural networks: Learning and acquisition of knowledge, Features of artificial neural networks, fundamentals of connectionist modeling.

UNIT IV

Neuro-fuzzy Systems: Architecture of neuro-fuzzy systems, Construction of neuro-fuzzy systems

UNIT V

Evolution Computing: Overview of evolution computing, Genetic algorithms and Optimization, The schema theorem: the fundamental theorem of genetic algorithms, Genetic algorithm operators, Integration of genetic algorithms with neural networks, Integration of genetic algorithms with fuzzy logic, Known issues of GAs.

UNIT VI

Applications from PR, IP, IRS, Share Market Analysis, Soft Computing forCalorRecipe Prediction case studies.

TEXT BOOK:

1. Soft computing and intelligent systems design, by Fakhreddine O. Karray and Clarence De Silva, Pearson Education, 2009

REFERENCE BOOK:

1. Neuro-Fuzzy and Soft Computing, J.S.R Jan, C.-T. Sun and E. Mizutani, PHI, 2005

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Mobile Application Development
(Program Specific Elective-3)

OBJECTIVES:

- Describe those aspects of mobile programming that make it unique from programming for other platforms,
- Critique mobile applications on their design pros and cons,
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
- Program mobile applications for the Android operating system that use basic and advanced phone features, and
- Deploy applications to the Android marketplace for distribution.

OUTCOMES:

- Be exposed to technology and business trends impacting mobile applications
- Be competent with the characterization and architecture of mobile applications.
- Be competent with understanding enterprise scale requirements of mobile applications
- Be competent with designing and developing mobile applications using one application development framework

UNIT I
J2ME Overview: Java 2 Micro Edition and the World of Java, Inside J2ME, J2ME and Wireless Devices.
Small Computing Technology: Wireless Technology, Radio Data Networks, Microwave Technology, Mobile Radio Networks, Messaging, Personal Digital Assistants, Mobile Power, Set-Top Boxes, Smart Cards.

UNIT II
J2ME Architecture and Development Environment: J2ME Architecture, Small Computing Device Requirements, Run-Time Environment, MIDlet Programming, Java Language for J2ME, J2ME Software Development Kits, Hello World J2ME Style, Multiple MIDlets in a MIDlet Suite, J2ME Wireless Toolkit.

UNIT III
J2ME Best Practices and Patterns*:* The Reality of Working in a J2ME World, Best Practices**.**
Commands, Items and Event Processing: J2ME User Interfaces, Display Class, The Palm OS Emulator, Command Class, Item Class, Exception Handling.

UNIT IV
High-Level Display Screens: Screen Class, Alert Class, Form Class, Item Class, List Class, Text Box Class, Ticker Class

UNIT V
Low-Level Display Canvas: The Canvas, User Interactions, Graphics, Clipping Regions, Animation

UNIT VI
Record Management System- Record Storage, Writing and Reading Records, Record Enumeration, Sorting Records, Searching Records, Record Listener.
JDBC Objects: The Concept of JDBC, JDBC Driver Types, JDBC Packages, Overview of the JDBC Process, Database Connection, statement Objects, Result set, Transaction Processing, Metadata, Data Types, Exceptions.

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TEXT BOOKS:

1. J2ME: The Complete Reference, James Keogh, Tata McGrawHill.

REFERENCES:

1. Enterprise J2ME: Developing Mobile Java Applications – Michael Juntao Yuan, Pearson Education, 2004
2. Beginning Java ME Platform, Ray Rischpater, Apress, 2009
3. Beginning J2ME: From Novice to Professional, Third Edition, Sing Li, Jonathan B. Knudsen, Apress, 2005
4. Kicking Butt with MIDP and MSA:Creating Great Mobile Applications,1st edition,J.Knudsen,Pearson.

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ADVANCED COMPUTER ARCHITECTURE
(Program Specific Elective-3)

OBJECTIVES:

- A broad understanding of computer architecture.
- To the extent possible, an understanding of the current state-of-the-art in uni-processor computer architecture.
- Study how to use technology to build the best computer/processor.
- To know different levels of parallelism.

OUTCOMES:

- Broad understanding of the design of computer systems, including modern architectures and alternatives.
- Understanding of the interaction amongst architecture, applications and technology.
- Understanding of a framework for evaluating design decisions in terms of application requirements and performance measurements.
- A historical perspective on computer system design.

UNIT - I

Fundamentals of Computer design- Technology trends- cost- measuring and reporting performance quantitative principles of computer design.

UNIT - II

Instruction set principles and examples- classifying instruction set- memory addressing- type and size of operands- addressing modes for signal processing-operations in the instruction set- instructions for control flow- encoding an instruction set.-the role of compiler

UNIT - III

Instruction level parallelism (ILP)- over coming data hazards- reducing branch costs –high performance instruction delivery- hardware based speculation- limitation of ILP

UNIT - IV

ILP software approach- compiler techniques- static branch protection - VLIW approach - H.W support for more ILP at compile time- H.W verses S.W Solutions

UNIT - V

Memory hierarchy design- cache performance- reducing cache misses penalty and miss rate – virtual memory- protection and examples of VM.

UNIT - VI

Multiprocessors and thread level parallelism- symmetric shared memory architectures- distributed shared memory- Synchronization- multi threading.

TEXT BOOK :

1. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier)

REFERENCES:

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1. "Computer Architecture and parallel Processing" Kai Hwang and A.Briggs International Edition McGraw-Hill.
2. Advanced Computer Architectures, Dezso Sima, Terence Fountain, Peter Kacsuk, Pearson.
3. Parallel Computer Architecture, A Hardware / Software Approach, David E. Culler, Jaswinder Pal singh with Anoop Gupta, Elsevier

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Computer Networks
(Program Specific Elective-4/MOOCS)

OBJECTIVES:

- An understanding of the overriding principles of computer networking, including protocol design, protocol layering, algorithm design, and performance evaluation.
- An understanding of computer networking theory, including principles embodied in the protocols designed for the application layer, transport layer, network layer, and link layer of a networking stack.
- An understanding of specific implemented protocols covering the application layer, transport layer, network layer, and link layer of the Internet (TCP/IP) stack.
- An understanding of security issues.

OUTCOMES:

- Students will learn to list and classify network services, protocols and architectures, explain why they are layered.
- Student will learn to explain key Internet applications and their protocols.
- Students will learn to explain security issues in computer networks.
- To master the terminology and concepts of the OSI reference model and the TCP-IP reference model.
- To master the concepts of protocols, network interfaces, and Design/performance issues in local area networks and wide area networks.

UNIT 1

Introduction: Uses of computer networks, Network Hardware, Network Software, References Models, ARPANET, NSFNET

UNIT II

The Physical Layer: The Theoretical Basis for Data Communication Guided Transmission Media, Wireless Transmission, Switching, Circuit Switching, Packet Switching, Message Switching.

UNIT III

The Data Link Layer: Data link Layer Design Issues, Elementary Data Link Protocols, Sliding Window Protocols, HDLC, The data Link layer in the Internet.

UNIT IV

The Medium Access Control Sublayer: The Channel allocation Problem, Multiple Access protocols, Ethernet-Ethernet Cabling, Manchester Encoding, The Ethernet MAC Sublayer Protocol. The Binary Exponential Backoff Algorithm, Ethernet Performance, Switched Ethernet, Fast Ethernet. Wireless Lans- The 802.11 Protocol Stack, The 802.11 Physical Layer, The 802.11 MAC Sub Layer Protocol, The 802.11 Frame Structure.

UNIT V

The Network Layer: Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms. Internetworking, The Network Layer in the Internet.

UNIT VI

The Transport Layer: The Transport Service, Elements of Transport Protocols, The Internet Transport Protocols: UDP, The Internet Transport Protocols: TCP.

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TEXT BOOKS:

1. Computer Networks, Andrew S. Tanenbaum, Fouth Edition, Pearson Education.

REFERENCES:

1. Computer Communications and Networking Technologies, Michael A. Gallo, William M. Hancock, Cengage Learning.
2. Computer Networks: Principles, Technologies and Protocols for Network Design, Natalia Olifer, Victor Olifer, Wiley India.
3. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, Tata McGraw Hill.
4. Understanding Communications and Networks, Third Edition, W.A.Shay, Cengage Learning.
5. Computer and Communication Networks, Nader F. Mir, Pearson Education
6. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose, K.W.Ross, Third Edition, Pearson Education.
7. Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group.

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DISTRIBUTED SYSTEMS

(Program Specific Elective – IV/MOOCS)

OBJECTIVES:

- Present the principles underlying the functioning of distributed systems;
- Create an awareness of the major technical challenges in distributed systems design and implementation;
- Expose students to modern and classic technology used in distributed systems and their software;
- Provide experience in the implementation of typical algorithms used in distributed systems

OUTCOMES:
After completing this course the student will be able 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;
- 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;
- Recognise 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;
- Understand implementation of file systems in Distributed Systems
- Understand how distributed systems concepts are implemented in AMOEBA and MACH

UNIT I
INTRODUCTION: What is Distributed System? Goals: Advantages of Distributed Systems over Centralized Systems, Advantages of Distributed Systems over Independent PCs, Disadvantages of Distributed Systems, Hardware Concepts, Design Issues: Transparency, Flexibility, Reliability, Performance, Scalability.
Communication in Distributed Systems I: Layered Protocols.
UNIT II
Communication in Distributed Systems II: The Client Server Model: Clients and servers, Addressing, Blocking Versus Nonblocking Primitives, Buffered versus Unbuffered Primitives, Reliable versus Unreliable Primitives, Implementing the Client-Server Model, Remote Procedure call, Group Communication.
UNIT III
Synchronization in Distributed Systems: Clock synchronization, Mutual Exclusion: A centralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm, A comparison of three algorithms, Election Algorithms: The Bully Algorithm, A Ring Algorithm, Atomic Transactions, Deadlocks in Distributed systems.
UNIT IV
Processes and Processors in Distributed Systems: Threads, System Models, Processor Allocation, Scheduling in Distributed Systems, Fault Tolerance, Real-Time Distributed

Systems: What is a Real-Time System? Design Issues, Real-Time Communication, Real-Time Scheduling.

UNIT V

Distributed File Systems and Shared Memory: Distributed File System Design: The File Service Interface, The Directory Service Interface, Semantics of File Sharing, Distributed File System Implementation: File Usage, System Structure, Caching, Replication, What is Shared Memory? Page-Based Distributed Shared Memory.

UNIT VI

CASE STUDY 1 AMOEBA: Introduction to AMOEBA, Objects and Capabilities, Process Management, Memory Management, Communication.

CASE STUDY 2 MACH: Introduction to MACH, Process management, Memory Management, Communication.

TEXT BOOKS:

1. Distributed Operating Systems, A.S.Tanenbaum, Pearson Education.

REFERENCES:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education

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 Operating Systems and Algorithm Analysis,R.Chow, T.Johnson,Pearson.

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Software Project Management
(Program Specific Elective-4/MOOCS)

Objective:

1. The objective of the course is to familiarize students in practice with the initiation, management and supervision of a software project.
2. During the course, actual software projects are defined and their implementation is managed and supervised.
3. To provide basic project management skills with a strong emphasis on issues and problems associated with delivering successful IT projects.
4. The module is designed to provide an understanding of the particular issues encountered in handling IT projects and to offer students methods, techniques and 'hands-on' experience in dealing with them.

Outcomes:

1. Understand and practice the process of project management and its application in delivering successful IT projects;
2. evaluate a project to develop the scope of work, provide accurate cost estimates and to plan
3. the various activities;
4. understand and use risk management analysis techniques that identify the factors that put a project at risk and to quantify the likely effect of risk on project timescales;
5. Identify the resources required for a project and to produce a work plan and resource schedule;

UNIT - I

Conventional Software Management: The waterfall model, conventional software Management performance.
Evolution of Software Economics: Software Economics, pragmatic software cost estimation.
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections

UNIT - II

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.
Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT - III

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.
Model based software architectures: A Management perspective and technical perspective.
Work Flows of the process: Software process workflows, Iteration workflows.

UNIT - IV

Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT - V

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.

UNIT - VI

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.
Tailoring the Process: Process discriminants, Example: small-scale versus large-scale project.

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TEXT BOOK:

1. Software Project Management, Walker Royce: Pearson Education, 2005.

REFERENCES:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.Software Project Management in practice, Pankaj Jalote, Pearson Education.2005.

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3 0

Constitution of India
(Audit Course)

Constitution of India – Basic features and fundamental principles The Constitution of India is the supreme law of India. Parliament of India can not make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world". Course content 1. Meaning of the constitution law and constitutionalism 2. Historical perspective of the Constitution of India 3. Salient features and characteristics of the Constitution of India 4. Scheme of the fundamental rights 5. The scheme of the Fundamental Duties and its legal status 6. The Directive Principles of State Policy – Its importance and implementation 7. Federal structure and distribution of legislative and financial powers between the Union and the States 8. Parliamentary Form of Government in India – The constitution powers and status of the President of India 9. Amendment of the Constitutional Powers and Procedure 10. The historical perspectives of the constitutional amendments in India 11. Emergency Provisions : National Emergency, President Rule, Financial Emergency 12. Local Self Government – Constitutional Scheme in India 13. Scheme of the Fundamental Right to

Equality 14. Scheme of the Fundamental Right to certain Freedom under Article 19 15. Scope of the Right to Life and Personal Liberty under Article 21.

Text Books

1. Introduction to Constitution of India, D.D. Basu, Lexis Nexus
2. The Constitution of India, PM Bhakshi, Universal Law

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I Year M.Tech(CS) - IISem **P** **C**

2 **1**

Object Oriented Analysis and Design Lab

OBJECTIVES:

- Identifying Building block of UML : things , relationships and diagrams
- Practice the notation for representing various UML diagrams
- Analyze and design the problem by representing using UML diagrams
- Become familiar with all phases of OOAD

OUTCOMES:

- Students will learn about various solutions to problems in object oriented approach.
- Students will learn about construction of UML diagrams and refine the UML diagrams.
- Students will learn the basics of OO analysis and design skills.
- Students will learn mapping of UML design diagrams to code.
- Students learn about various testing techniques.
- Students will learn about forward and reverse engineering.

UML diagrams to be developed are:

- Use Case Diagram.
- Class Diagram.
- Sequence Diagram.
- Collaboration Diagram.
- State Diagram
- Activity Diagram.
- Component Diagram
- Deployment Diagram.
- Test Design.

Problems that may be considered are:

1. College information system
2. ATM system
3. Passport automation system.
4. Book bank
5. Exam Registration

6. Stock maintenance system.
7. E-ticketing
8. Credit card processing
9. Library Management System
10. Student Information System

TEXT BOOKS:

1. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

REFERENCE BOOKS:

2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.

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I Year M.Tech(CS) - IISem	**P**	**C**
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DATA WAREHOUSING AND DATA MINING LAB

Objectives:

- Applications that can enable them to set up and manage an industrial data warehousing and data mining system.
- To get knowledge by practicing programs.

Outcomes:

- Familiarity with requirements engineering for data warehouses.
- Have a good knowledge of the fundamental concepts that provide the foundation of data mining.

1) Implement the following data mining Techniques in C/C++/Java Language Preprocessing techniques

   a) Data Cleaning

   b) Data Integration and Transformation

   c) Data Reduction

   d) Data Discretization and Concept hierarchy Generation

2) Association Rule Mining

   a) Apriori Algorithm (With candidate generation)

   b) FP-Growth Algorithm (Without candidate generation)

3) Classification methods

   a) Naïve Bayes

   b) Back Propagation

   c) SVM

   d) k-NNC

4) Clustering Methods

   a) k-Means

   b) k-Medoids(Partition Medoids)

   c) BIRCH

   d) DBSCAN

Implementation of data mining algorithms by attribute relation file formats in weka tool.

5) Develop an application to implement OLAP rollup, slice and dice operation.

6) Develop an application to construct a multidimensional data.

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II Year M.Tech(CS) - ISem **T C**
3 3

CLOUD COMPUTING
(Program Specific Elective – 5)

COURSE OBJECTIVES:

- To introduce the broad perceptive of cloud architecture and mode
- To understand the concept of Virtualization
- To understand the design of cloud Services.
- To learn to design the trusted cloud Computing system
- To build Private Cloud.

COURSE OUTCOMES

- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google AppEngine.
- Analyze the performance, scalability, and availability of the underlying cloud technologies and software.
- Address the core issues of cloud computing such as security, privacy and interoperability
- Solve a real-world problem using cloud computing through group collaboration.

UNIT – I Introduction to Cloud Computing

Introduction - Definition of Cloud Computing, Characteristics of Cloud Computing, Cloud Models - Service Models, Deployment Models, Cloud Services Examples - IaaS: Amazon EC2, Google Compute Engine, Azure VMs, PaaS: Google App Engine, SaaS: Salesforce, cloud services Examples-cloud based services and Application.

UNIT – II Cloud Concepts & Technologies

Virtualization, Load Balancing, Scalability & Elasticity, Deployment, Replication, Monitoring, Software Defined Networking, Network Function Virtualization, MapReduce, Identity and Access Management, Service Level Agreements, Billing.

UNIT – III Cloud Services

Compute Services - Amazon Elastic Compute Cloud, Google Compute Engine, Windows Azure Virtual Machines. Storage Services - Amazon Simple Storage Service, Google Cloud Storage, Windows Azure Storage. Database Services - Google Cloud SQL, Google Cloud Data store, Application services –content delivery services –Analytic Services.

UNIT – IV Cloud Application Design

Design Considerations for Cloud Applications – Scalability, Reliability & Availability, Security, Maintenance & Upgradation, Performance. Reference Architectures for Cloud Applications, Cloud Application Design Methodologies - Service Oriented Architecture, Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller, RESTful Web Services. Data Storage Approaches - Relational (SQL) Approach, Non-Relational (No-SQL) Approach.

UNIT – V Cloud Security

CSA Cloud Security Architecture, Authentication- Single Sign-on (SSO), Authorization, Identity & Access Management, Data Security - Securing Data at Rest, Securing Data in Motion. Key Management, Auditing.

UNIT – VI Cloud for Industry, Healthcare & Education

Cloud Computing for Healthcare , Cloud Computing for Energy Systems , Cloud Computing for Transportation Systems , Cloud Computing for Manufacturing Industry , Cloud Computing for Education.

TEXT BOOK

1. **Arshdeep Bahga, Vijay Madisetti "Cloud computing A Hands on Approach" 2014.**

REFERENCES

2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
4. Kumar Saurabh, " Cloud Computing – insights into New-Era Infrastructure", Wiley India,2011
   George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly

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II Year M.Tech(CS) – I Sem

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3	3

DISTRIBUTED SYSTEMS

(Program Specific Elective – 5)

OBJECTIVES:

- Present the principles underlying the functioning of distributed systems;
- Create an awareness of the major technical challenges in distributed systems design and implementation;
- Expose students to modern and classic technology used in distributed systems and their software;
- Provide experience in the implementation of typical algorithms used in distributed systems

OUTCOMES:

- 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;
- 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;
- Recognise 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;
- Design a distributed system that fulfils requirements with regards to key distributed systems properties (such as scalability, transparency, etc.), be able to recognise when this is not possible, and explain why;

UNIT-I

Introducton of Distributed System: Goals, Hardware Concepts, Software Concepts, the Client-Server Model.

UNIT-II

Communication: Remote Procedure Call, Remote Object Invocation, Message Oriented Communication, Stream-Oriented Communication.

UNIT-III

Processes: Threads, Clients, Servers, Code Migration, Software Agents. NAMING: Naming Entities, Locating Mobile Entities.

UNIT-IV

Synchronization: Clock Synchronization, Logical Clocks, Global State, Election Algorithms, Mutual Exclusion, Distributed Transactions.

UNIT-V

Consistency And Replication: Introduction, Data-Centric Consistency Models, Client Centric Consistency Models, Distribution Protocols, Consistency Protocols, Examples.

UNIT-VI

Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery.

TEXT BOOKS

2. Andrew S. Tanenbaum, Maarten Van Steen. Distributed Systems – Principles and Paradigms 2/e, PHI, 2004.

REFERENCE BOOKS

4. Pradeep K. Sinha, “Distributed Operating Systems Concepts and Design”, PHI 2002.
5. Randy Chow Theodore Johnson, “Distributed Operating Systems and Algorithm Analysis”, PEA, 2009.
6. George Couloris, Jean Dollimore, Tim Kind berg, “Distributed Systems Concepts and Design”, 3/e, PEA, 2002.

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II Year M.Tech(CS) – I Sem	T	C
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Big Data Analytics
(Program Specific Elective – 5)

Objective:

Understand big data for business intelligence. Learn business case studies for big data Analytics. Understand nosql big data management. Perform map-reduce analytics using Hadoop and related tools

Outcomes:

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

UNIT-1

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

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UNIT-V

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

UNIT-VI

Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.

References:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging
2. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
3. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
4. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
5. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
6. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
8. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
9. Alan Gates, "Programming Pig", O'Reilley, 2011.

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3 2

Human Computer Interaction

(Open Elective – 1 / MOOCS)

OBJECTIVES:

1. To expose students to the central concepts of Human-Computer Interaction.
2. Establish target users, functional requirements, and interface requirements for a given computer application
3. Describe and explain user interface design principles, and apply them to designing an interface.
4. Develop quick-and-dirty interface designs using rapid prototyping methods.

OUTCOMES:

1. Apply HCI principles and a user-centered approach to interaction design.
2. Analyze user needs and requirements.
3. Design and develop prototypes based on user assessments (needs and requirements), while applying HCI principles and models.
4. Apply evaluation and usability testing methods to interactive products to validate design decisions.

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

Windows – Select the proper kinds of Windows: Characteristics, Components of a window, Presentation Styles, Types of Windows, Window Management, Window Operations. Select the Proper Device-Based controls: Characteristics, Selecting the Proper Device-Based Control.

UNIT - VI

Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.
Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

TEXT BOOKS:

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

REFERENCES :

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1. Human – Computer Interaction. ALAN DIX, JANET FINCAY, GRE GORYD, ABOWD, RUSSELL
2. BEALG, PEARSON.
3. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dreamtech,
4. User Interface Design, SorenLauesen , Pearson Education.

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II Year M.Tech(CS) - ISem **T** **C**
3 **2**

Network Security & Cryptography

(Open Elective – 1/MOOCS)

OBJECTIVES:

This course covers the major aspects of computer and network security. It starts with a general introduction to information security, then proceeds to cover types of threats and attacks, hacking techniques, network vulnerabilities, security policies and standards, firewalls, cryptography, Authentication & digital signatures, the SSL protocol, Wireless security, intrusion detection and prevention

OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on:

- Cryptographic algorithms and their mathematical models
- Message Authentication
- Digital Signatures
- Phishing and Identity Theft

CO2. Analyze vulnerabilities and threats on information systems based on various security parameters.

CO3. Apply security and privacy methods to protect and prevent cyber crimes.

CO4. Solve information privacy issues using encryption and digital signatures.

CO5. Use firewall and PGP to protect network and e-mail respectively.

CO6. Follow standards in implementation of network security.

UNIT-I

Security goals, Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Inter network security, Internet Standards and RFCs.

Classical Encryption Techniques: Symmetric cipher model, Substitution techniques- Ceaser cipher, Hill cipher, Poly and mono alphabetic cipher, Transposition techniques. cryptography, stenography, possible types of attacks.

UNIT-II

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Mathematical Tools for Cryptography: Introduction to number theory, prime & relative numbers, modular arthimetic, Fermat's and Euler's theorems, testing for primality, Chinese remainder theorem, Discrete logarithms.

Symmetric key Ciphers: Block Cipher principles & Algorithms(DES, AES,), Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers,Location and placement of encryption function, Key distribution.

UNIT-III

Public key cryptography principles, public key cryptography algorithms(RSA, Diffie-Hellman, ECA,ECC), Key Distribution.

UNIT-IV

Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Public Key Encryption, Message authentication codes, Hash Functions, Introduction to Digital signatures , Digital Signature Stadard, Secure hash algorithm, HMAC, X.509 Authentication Service.

UNIT-V

E-Mail Security: Pretty Good Privacy, S/MIME

IP Security: IP security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, key management.

UNIT-VI

Web Security: Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

Firewalls: Introduction to Firewalls, types of firewalls, firewall configurations

TEXT BOOKS:

1. Cryptography and Network Security : William Stallings, Pearson Education,4″‘ Edition

REFERENCES:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education 4″‘ Edition

2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.

3. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH.

4. **Cryptography & Network Security** by Behrouz A. Forouzan, TMH 2007.

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3 2

ARTIFICIAL INTELLIGENCE

(Open Elective – 1/MOOCS)

Objective:

With the usage of Internet and World Wide Web increasing day by day, the field of AI and its techniques are being used in many areas which directly affect human life. Various techniques for encoding knowledge in computer systems such as Predicate Logic, Production rules, Semantic networks find application in real world problems. The fields of AI such as Game Playing, Natural Language Processing are also important. Student should know some programming language for AI.

Course Outcomes:

After learning the course the students should be able to

- Gain basic understanding on Artificial intelligence.
- Gain knowledge about various kinds of problem solving issues in AI.
- Understand various search methods.
- Use various knowledge representation methods.
- Understand importance of logic.
- Understand basics of natural language processing.

UNIT – I

Introduction to Artificial Intelligence

What is AI?, brief history of AI, The AI Problems, The Underlying Assumption, What are AI Techniques, Artificial Intelligence and related fields, applications of Artificial Intelligence, intelligent agents: Agents and Environments, the nature of environments, structure of agents

UNIT -II

Problem Solving

Problem Definition, Problem as a state space search, problem solving agents, Problem formulation, Problem types, Well-defined problems, Constraint satisfaction problem, Game playing, Production systems.

UNIT-III

Search Techniques

Uninformed search techniques- depth first search, breadth first search, depth limit search, and search strategy comparison, Search with partial information (Heuristic search),Greedy best first search, A* search, Game Playing: Adversarial search techniques-minimax procedure, Alpha-Beta pruning

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UNIT – IV

Knowledge Representation Issues

Representations And Mappings, Approaches To Knowledge Representation,logical Agents, Knowledge – Based Agents, the Wumpus world, logic, propositional logic, Resolution patterns in propos ional logic

UNIT – V

Representing Knowledge Using Rules

Procedural Versus Declarative Knowledge,First order logic. Inference in first order logic, propositional Vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution.

UNIT-VI

Natural Language Processing

Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, Discourse And Pragmatic Processing, Spell Checking

Text Books:

1. "Artificial Intelligence" -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill
2. Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI
3. Saroj Kaushik. Artificial Intelligence. Cengage Learning. 2011

Reference Books:

1. D. W. Patterson, Artificial Intelligence and Expert Systems, Prentice Hall.
2. P. H. Winston, Artificial Intelligence, Addison Wesley.
3. Introduction to Artificial Intelligence by Eugene Charniak, Pearson.
4. Introduction to Artificial Intelligence and expert systems Dan W.Patterson. PHI.
5. Artificial Intelligence by George Fluger rearson fifth edition.