ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

M. Tech.
COMPUTER SCIENCE & ENGINEERING

(Applicable for the batches admitted from 2015-2016)

VALLURUPALLI NAGESWARA RAO VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

An Autonomous Institute, Accredited by NAAC with 'A' Grade
NBA Accreditation for CE, EEE, ME, ECE, CSE, EIE, IT B.Tech. programmes
Approved by AICTE, New Delhi, Affiliated to JNTUH
Recognized as "College with Potential for Excellence" by UGC
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VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

HYDERABAD

An Autonomous Institute

Academic Regulations - M.Tech.. Programme
(Applicable for the batches admitted from the academic year 2015-2016)

1. Introduction

Academic programmes of the institute are governed by rules and regulations as approved by the Academic Council of the institute.

These academic rules and regulations are effective from the academic year 2015-16, for the students admitted into two year post graduate programme offered by the college leading to Master of Technology (M. Tech.) degree in different specializations offered by the departments of Civil Engineering, Electrical and Electronics Engineering, Mechanical Engineering, Electronics and Communication Engineering, Computer Science and Engineering, Information Technology and Electronics and Instrumentation Engineering.

The M.Tech.. degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on students who are admitted to the programme after fulfilling all the requirements for the award of the degree.

1.1 Eligibility for Admissions

Admission to the above program shall be made subject to the eligibility and qualifications prescribed from time to time. Admissions shall be made on the basis of GATE Rank and merit rank obtained at an Entrance Test conducted by the TSSCHE or as decided by TSSCHE subject to reservations prescribed by the university/ State Government from time to time.

2. Programmes of study

The following two year M.Tech.. degree programmes of study are offered by the departments at VNR VJIET.

Department	Specializations
ME	1. Advanced Manufacturing Systems 2. Automation 3. CAD/CAM
CE	1. Highway Engineering 2. Structural Engineering 3 Geotechnical Engineering
EEE	1. Power Electronics 2. Power Systems
CSE	1. Software Engineering 2. Computer Science and Engineering
ECE	1. VLSI System Design 2. Embedded Systems
EIE	Electronics and Instrumentation
IT	Computer Networks and Information Security

- **'ENGLISH'** language is used as the medium of instruction in all the above programmes.

3. Attendance requirements

Each academic year shall be divided into two semesters, each of 90 Instructions days, excluding examination, evaluation, declaration of results etc.

3.1 A student shall be eligible to appear for the semester end examinations in subject if he / she acquire a **minimum of 75% of attendance in that subject.**

3.2 Shortage of attendance up to 10% in any subject (i.e., attendance of 65% and above and below 75%) in a semester may be condoned by the Institute Academic Committee based on the rules prescribed by the Academic Council of the Institute from time to time.

3.3 A student shall get **minimum required attendance in at least three (03) theory subjects** in the present semester to get promoted to the next semester. In order to qualify for the award of the M.Tech.. degree, the student shall complete all the academic requirements of the subjects, as per the course structure.

3.4 Shortage of **attendance below 65% shall in NO case be condoned**.

3.5 A stipulated fee shall be payable towards condonation of shortage of attendance.

3.6 In case the student secures less than the required attendance in any subject(s), he shall not be permitted to appear for the semester end examination in that subject(s). He shall re-register for the subject when offered next.

4. Evaluation

i. The performance of a student in each semester shall be evaluated subject–wise with a maximum of **100 marks for theory** and **100 marks for practical subjects**. In addition, **mini-project** and **comprehensive viva-voce** shall be evaluated for **100 marks** respectively.

ii. For theory subjects, the distribution shall be **40 marks for mid-term evaluation** and **60 marks for the semester end examination**.

❖ **Mid-Term Evaluation (40 M):**

Mid-term evaluation consists of **mid-term examination (30 M)** and **assignment/objective test/ case study/course project (10 M).**

➢ **Mid-term examination (30 M):**

- For theory subjects, two mid-term examinations shall be conducted in each semester as per the academic calendar. Each mid-term examination shall be evaluated for 30 marks.
- Pattern of Mid-term examination:
  3 X 10M = 30 M (three internal choice questions one from each UNIT shall be given, the student has to answer ONE question from each UNIT)
- There shall be TWO mid-term examinations for each subject and the average of two mid-term examinations shall be considered for calculating final mid-term examination marks in that subject.

➢ **Assignment/objective exam/ case study/course project (10 M):**

- Two assignment/objective exam/ case study/course project shall be given to the students covering the syllabus of first mid-term and second mid-term examinations respectively and evaluated for 10 marks each.
- The first assignment/objective exam/ case study/course project shall be submitted before first mid-term examination and the second one shall be submitted before second mid-term examination.
- The average of 2 assignments shall be taken as final assignment marks.

iii. For practical subjects, there shall be a **continuous evaluation during the semester for 40 marks and 60 marks for semester end examination**. Out of the 40 marks, **day-to-day work in the laboratory shall be evaluated for 10 marks**, and **15 marks for practical examination** and **15 marks for laboratory record.**

❖ **Semester End Examination (60 M):**

(a) Theory Courses

Question paper pattern for semester end examination (60 Marks)

- Paper shall consist of 05 questions of 10 marks each. (05X12M = 60 M)
- There shall be 01 question from each unit with internal choice.

(b) Practical Courses

Each laboratory course shall be evaluated for 60 marks. The semester end examination shall be conducted by two examiners, one Internal and other external concerned with the subject of the same / other department / Industry. The evaluation shall be as per the standard format.

4.1. Evaluation of Mini-Project: There shall be two presentations during the first year, one in each semester. For mini-project 1 and mini-project 2, a student under the supervision of a faculty member, shall collect the literature on a topic, critically review the literature, carry out the mini-project, submit it to the department in a report form and shall make an oral presentation before the departmental Project Review Committee (PRC). The Departmental PRC consists of Head of the Department, supervisor and one senior faculty member of the department. For each mini-project there shall be only internal evaluation of 100 marks. A student has to secure a minimum of 50% to be declared successful.

4.2. There shall be a comprehensive viva-voce in II year I semester. The comprehensive viva- Voce shall be conducted by a committee consisting of Head of the Department and two senior faculty members of the department. The comprehensive viva-voce is aimed to assess the students' understanding in various subjects studied during the M.Tech.. programme of study. The comprehensive viva-voce shall be evaluated for 100 marks by the committee. There are no internal marks for the comprehensive viva-voce. A student must secure a minimum of 50% to be declared successful.

4.3. A student shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the semester end examination and a minimum aggregate of 50% of the total marks in the semester end examination and mid-term evaluation taken together.

4.4. A student shall be given one chance to re-register, after completion of the course work, for each subject, provided the internal marks secured by a student are less than 50% and he has failed in the semester end examination. In such a case student may re-register for the subject(s) and secure required minimum attendance. Attendance in the re-registered subject(s) has to be calculated separately to become eligible to write the end examination in the re-registered subject(s). Re-registration for the subjects is allowed only if that particular re-registration subjects are the hindrance for the award of Degree. Re-registration is allowed in this case provided the student doesn't have any subject(s) yet to pass other than the re-registration subjects where the internal marks are less than 50% with prior permission.

4.5. Laboratory examination for M.Tech.. courses must be conducted with two examiners, one of them being laboratory class teacher and second examiner shall be a teacher of same specialization either external or a teacher from the same department other than the teacher who conducted laboratory classes for that batch.

5. Evaluation of Project / Dissertation Work.

5.1 Registration of Project Work: A student shall be permitted to register for the project work after satisfying the attendance requirement of all the subjects (theory and practical subjects).

5.2 A Project Review Committee (PRC) shall be constituted with at least four members namely HOD, PG coordinator of the M.Tech.. programme, project supervisor and one senior faculty member of same specialization.

5.3 After getting permission as per 5.1, a student has to submit, in consultation with the project supervisor, the title, objective and plan of action of his project work to the Departmental PRC for its approval. Only after obtaining the approval of PRC, the student can initiate the project work.

5.4 If a student wishes to change his supervisor or topic of the project he can do so with the approval of PRC. However, the committee shall examine whether the change of topic/supervisor leads to a major change of his initial plans of project proposal. If so, the date of registration for the project work shall be the date of change of supervisor or topic as the case may be.

5.5 Internal evaluation of the project shall be on the basis of the seminars (Project reviews) conducted during the second year by the PRC. A student shall submit draft report in a spiral bound copy form.

5.6 The work on the project shall be initiated in the beginning of the second year and the duration of project is for two semesters. A student is permitted to submit Project work only after successful completion of theory and practical course with the approval of PRC not earlier than 240 days from the date of registration of the project work. For the approval of PRC the student shall submit the draft copy of thesis to the Head of the Department (Through project supervisor and PG coordinator) and shall make an oral presentation before the PRC.
The student is eligible to submit project work if he has published at least one paper covering 70% of the project work and presented his project work in Show and Tell activity.

5.7 After approval of PRC, every student has to submit three copies of the project dissertation certified by the supervisor to the Department.

5.8 The dissertation shall be adjudicated by one examiner selected by the Chief Superintendent. For this, HOD shall submit a panel of 3/ 5 examiners, who are eminent in that field with the help of the concerned guide.

5.9 If the report of the examiner is not favourable, the student shall revise and resubmit the Dissertation, within the time frame as prescribed by PRC. If the report of the examiner is unfavourable again, the dissertation shall be summarily rejected.

5.10 If the report of the examiner is favorable, viva-voce examination shall be conducted by a board consisting of the project supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The Board shall jointly report students work as:

A. Excellent
B. Good
C. Satisfactory
D. Unsatisfactory

Head of the Department shall coordinate and make arrangements for the conduct of viva-voce examination. The student has to secure any one of the grades as Excellent, Good or Satisfactory on his dissertation and viva-voce. If the report of the viva-voce is unsatisfactory, the student shall retake the viva-voce examination after three months, making modifications as suggested. If he fails to get a satisfactory report at the second viva-voce examination, he has to re-register for the project work as mentioned in clause 5.1. However, the student may select a new guide or new topic or both with the approval of the PRC and submit the project dissertation with a minimum of 240 days from the date of re-registration. Of course, this shall not prejudice the clause 6.1 below.

6. Award of Degree and Class

A student shall be declared eligible for the award of the M.Tech.. degree, if he pursues a course of study and complete it successfully for **not less than two academic years** and **not more than four academic years**.

6.1 A student, who fails to fulfil all the academic requirements for the award of the degree within four academic years from the year of his admission, for any reason whatsoever, shall forfeit his seat in M.Tech.. Course.

6.2 A student shall register and put up **minimum academic requirement in all 84 credits** and earn **84 credits.** Marks obtained in all 86 credits shall be considered for the calculation of Cumulative Grade Point Average (CGPA).

6.3 CGPA System:

Method of awarding absolute grades and grade points in two year M.Tech.. degree programme is as follows:

- Absolute Grading Method is followed, based on the total marks obtained in mid-term evaluation and semester end examinations.

- Grades and Grade points are assigned as given below.

Marks Obtained	Grade	Description of Grade	Grade Points(GP) Value Per Credit
>=90	O	Outstanding	10.00
>=80 and <89.99	A	Excellent	9.00
>=70 and <79.99	B	Very Good	8.00
>=60 and <69.99	C	Good	7.00
>=50 and <59.99	D	Pass	6.00
<50	F	Fail	
Not Appeared the Exam(s)	N	Absent	

The student is eligible for the award of the M.Tech. degree with the class as mentioned in the following table.

CGPA	Class
>= 8.0	First Class with Distinction
>= 7.0 and <8.0	First Class
>= 6.0 and < 7.0	Second Class

- **Calculation of Semester Grade Points Average (SGPA):**

- The performance of each student at the end of the each semester shall be indicated in terms of SGPA. The SGPA shall be calculated as below:

$$\text{SGPA} = \frac{\text{Total earned weighted grade points in a semester}}{\text{Total credits in a semester}}$$

$$\text{SGPA} = \frac{\sum_{i=1}^{p} C_i * G_i}{\sum_{i=1}^{p} C_i}$$

Where Ci = Number of credits allotted to a particular subject 'i'

Gi = Grade point corresponding to the letter grade awarded to the subject 'i'

i = 1,2,…..p represent the number of subjects in a particular semester

Note: SGPA is calculated and awarded for the students who pass all the courses in a semester.

➢ **Calculation of Cumulative Grade Point Average (CGPA):**

The CGPA of a student for the entire programme shall be calculated as given below:

- Assessment of the overall performance of a student shall be obtained by calculating Cumulative Grade Point Average (CGPA), which is weighted average of the grade points obtained in all subjects during the course of study.

$$\text{CGPA} = \frac{\text{Total earned weighted grade points for the entire programme}}{\text{Total credits for the entire programme}}$$

$$\text{CGPA} = \frac{\sum_{j=1}^{m} C_j * G_j}{\sum_{j=1}^{m} C_j}$$

Where Cj = Number of credits allotted to a particular subject 'j'

Gj = Grade Point corresponding to the letter grade awarded to that subject 'j'

j = 1,2,….m represent the number of subjects of the entire program.

- Grade lower than D in any subject shall not be considered for CGPA calculation. The CGPA shall be awarded only when the student acquires the required number of credits prescribed for the program.

➢ **Grade Card**

The grade card issued shall contain the following:

a) The credits for each subject offered in that semester

b) The letter grade and grade point awarded in each subject

c) The SGPA/CGPA

d) Total number of credits earned by the student up to the end of that semester.

7. Withholding of Results

If the student has not paid dues to the Institute, or if any case of indiscipline is pending against him, the result of the student may be withheld and he shall not be allowed into the next higher semester. The award or issue of the provisional certificate and the degree may also be withheld in such cases. This delay shall not prejudice clauses Nos.6.0 and 6.1.

8. Transitory Regulations

Students who have discontinued or have been detained for want of attendance or any other academic requirements, may be considered for readmission as and when they become eligible. They have to take up Equivalent subjects, as substitute subjects in place of repeated subjects as decided by the Chairman of the BoS of the respective departments. He/She shall be admitted under the regulation of the batch in which he/she is readmitted.

9. Minimum Instruction Days

The minimum instruction days for each semester shall be **90 instruction days.**

10. General

10.1 The academic regulations should be read as a whole for purpose of any interpretation.

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

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

10.4 Wherever the words he, him or his occur, they shall also include she, her and hers.

11. Supplementary Examination

Supplementary examinations shall be conducted along with regular semester end examinations. (During even semester regular examinations, supplementary examinations of odd Semester and during odd semester regular examinations, supplementary examinations of even semester shall be conducted).

Program Educational Objectives (PEO's)

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

1. To develop technologically competent IT professionals in today's IT centric scenario by training them in the contemporary software engineering principles and paradigms.
2. To develop a well balanced insight into various cutting edge technologies by studying the functional details of the technologies in great detail thereby creating diverse educational opportunities.
3. To provide students with advanced software engineering and project management skills, as well as specialized skills in major application domains like Web Technologies, Distributed Databases, Image Processing, Mobile Computing, Distributed Computing etc.
4. To improve analytical, logical and presentation skills of the students by applying up-to-date technologies in software engineering in developing practical solutions to complex problems .
5. To prepare the students to take up research oriented projects, industry-oriented internships and entrepreneurship endeavors equipped with professional skills and team-work culture.
6. To train the students to communicate effectively, work with multi-disciplinary teams, recognize and incorporate industry specific needs and constraints in their professional endeavors, and practice the Computer Engineer profession with high regard to legal and ethical responsibilities.

Program Outcomes (PO's)

Program Outcomes are narrower statements that describe what students are expected to know and be able to do upon the graduation. These relate to the skills, knowledge, and behavior that students acquire in their matriculation through the program.

1. Apply the knowledge of software engineering principles and paradigms in the design of system components and processes that meet the specific needs of the industry and take up high-end technical roles like software analyst, software architect, research engineer etc.
2. Identify, analyze and formulate solutions to complex engineering problems using principles of engineering sciences and function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
3. The Post Graduates cultivate an ability to use the techniques, skills, and software engineering tools necessary for engineering practice and coordinate the construction, maintenance, and expansion of an organization's computer systems.
4. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation and make effective presentations.
5. Ability for self-learning and pursuing of higher studies in engineering sciences and capacity to upgrade qualifications and attain constructive growth in profession.
6. Apply ethical principles and values and commit to professional ethics and responsibilities and norms of the engineering practice.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M. TECH. (COMPUTER SCIENCE & ENGINEERING)

(R15 Regulation)

I YEAR I SEMESTER **COURSE STRUCTURE**

Code	Group	Subject	L	T/P	Credits
CSE01		Advanced Data Structures and Algorithms	3	1	4
CSE02		Computer System Design	3	1	4
CSE03		Advanced Operating Systems	3	1	4
CNS11		Advanced Databases	3	0	3
SWE25	**Elective –I**	Internet of Things	3	0	3
CSE04		Soft Computing			
CSE05		User Interface Design			
CSE06	**Elective –II**	Machine Learning	3	0	3
CSE07		Software Project Management			
CSE08		Parallel and Distributed Algorithms			
CSE51	**Lab**	Advanced Data Structures and Algorithms Lab	0	3	2
CSE61		Mini Project - I	0	0	4
Total			**18**	**6**	**27**

I YEAR II SEMESTER **COURSE STRUCTURE**

Code	Group	Subject	L	T/P	Credits
CSE09		Advanced Network Programming	3	1	4
CNS14		Distributed Systems	3	0	3
SWE05		Web Services and Service Oriented Architecture	3	1	4
SWE04		Data Analytics	3	1	4
CSE10	Elective –III	Storage Area Networks	3	0	3
SWE16		Cloud Computing			
CSE11		Database Security			
CSE12	Elective –IV	Semantic Web and Social Networks	3	0	3
CSE13		Information Retrieval Systems			
SWE24		Research Methodology			
CSE52	Lab	Web Services and Data Analytics Lab	0	3	2
CSE62		Mini Project II	0	0	4
Total			**18**	**6**	**27**

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M. Tech. (COMPUTER SCIENCE & ENGINEERING)

(R15 Regulation)

II YEAR I SEMESTER **COURSE STRUCTURE**

Code	Subject	L	P	Credits
CSE63	Comprehensive Viva Voce	0	0	4
CSE71	Internship/Dissertation Phase- I	0	0	8
Total		**0**	**0**	**12**

II YEAR II SEMESTER **COURSE STRUCTURE**

Code	Subject	L	P	Credits
CSE72	Dissertation Phase - II	0	0	18
Total		**0**	**0**	**18**

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

I Year – I Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**1**	**4**

(CSE01) ADVANCED DATA STRUCTURES AND ALGORITHMS

Course Objectives:

- Introduce the structured representation of data in computer systems and programming languages.
- Analyse the time and size efficiency trade-offs of the various data structures and access algorithms.
- Create structures that maintain complex data relationships in order to access, search through and modify that data in an organized and efficient manner.

Course Outcomes:

- Using Java programming language to create data structures
- Organizing data into lists, stacks and queues and developing efficient algorithms to access that data using iteration and recursion to solve complex, real-world problems.
- Familiarity with other complex data structures such as trees and graphs

UNIT I:

Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big Oh, Omega and Theta notations, Complexity Analysis Examples.

Data structures-Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, Vector representation, singly linked lists -insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two dimensional arrays, Sparse matrices and their representation.

UNIT II:

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

UNIT III:

Searching–Linear and binary search methods, Hashing-Hash functions, Collision Resolution methods-Open Addressing, Chaining, Hashing in java.util-HashMap, HashSet, Hashtable.

Sorting –Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort, comparison of sorting methods.

UNIT IV:

Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non recursive traversals, Java code for traversals, Threaded binary trees.

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

UNIT V:

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

Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.

Text Books:

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

References:

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

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

I Year – I Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**1**	**4**

(CSE02) COMPUTER SYSTEM DESIGN

Course Objectives:

- To identify the elements instructions sets, addressing modes and I/O organization,
- To explain the function of hardwired and micro programmed control, including instruction pipelines,
- To understand functions of each element of memory hierarchy,
- To identify the functionality of processes, threads and IPC,
- To implement file system of any type of operating system and it's security aspects

Course Outcomes:

Upon completing the course students will be able to

- Analyze architectures and computational designs in terms of instruction sets , addressing modes and I/O organization
- Design a pipeline for consistent execution of instructions and bus organization.
- Understand alternatives in cache design and their impacts on cost/performance
- Understand file system implementation and the security issues addressing in various operating system

UNIT I:

Computer Structure – hardware, software, system software, Von-Neumann architecture – case study. IA -32 Pentium: registers and addressing, instructions, assembly language, program flow control, logic and shift/rotate instructions, multiply, divide MMX, SIMD instructions, I/O operations, subroutines.

Input/output organization, interrupts, DMA, Buses, Interface circuits, I/O interfaces, device drivers in windows, interrupt handlers

UNIT II:

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

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

UNIT III:

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

UNIT IV:

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

UNIT V:

File system: Files, directories, Implementation, Unix file system

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

Text Books:

1. William Stallings: Computer Organization and Architecture Designing for Performance, 8th Edition, Pearson Education, 2010.
2. Sivarama P.Dandamudi: Fundamentals of Computer Organization and Design, Springer International Edition, 2009.
3. Modern Operating System , Andrew S Tanenbaum 2nd edition Pearson/PHI

References:

1. Operating System Principles-Abraham Silberchatz, Peter B Galvin, Greg Gagne 7th edition, John Wiley
2. Moris Mono : Computer System Architecture, 3rd Edition,Pearson / PHI, 1993.
3. Hamacher, Vranesic, Zaky : Computer Organization, 5th Edition,TMH, 2002.
4. Operating Systems – Internals and Design Principles, Stallings , 5th Edition-2005, Pearson Education/PHI
5. IA32 Intel Architecture Software Developer's Manual, Volume 3: Operating System Writer's Manual, Intel Corporation, 2003.
6. John D. Carpinelli : Computer systems organization and architecture, 1st Edition, Pearson, 2001.
7. Pal Chowdary : Computer organization and Design, 2nd Edition,PHI, 2004.
8. Naresh Jotwani : Computer system organization, 1st Edition, TMH,2009

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

I Year – I Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**1**	**4**

(CSE03) ADVANCED OPERATING SYSTEMS

Course Objectives:

- To understand main components of Real time Operating system and their working
- To study the operations performed by OS as a resource manager
- To understand the scheduling policies of DOS
- To implement the working principles of OS

Course Outcomes:

- Students explains what a real-time operating system (RTOS) is, how real-time operating systems are useful for measurement and control applications.
- Understand Distributed Operating System Design issues, features and principles of working
- Analyse Functions of Network operating systems
- Understand Kernel Issues and development principles
- Able to implement Protection, privacy, access control and security for real time Applications.

UNIT I:

Real-time Operating Systems: Introduction to Real-Time Operating Systems, Definitions, Role of an OS in Real Time Systems, Important Terminology and Concepts Example Real-Time Applications, How Real-Time OSs Differ from General-Purpose OSs, Design issues, principles and case study.

UNIT II:

Distributed Operating System: Introduction to Distributed Systems, Definitions, Goals, Advantages of Distributed Systems over Centralized Systems, Advantages of Distributed Systems over Independent PCs, Disadvantages of Distributed Systems Design issues, features and principles of working, case study.

UNIT III:

Network Operating System: Introduction to Network operating system, Definitions, Different types of network operating systems, Function of Network operating systems, Design issues, working principles and characteristic features, case study.

UNIT IV:

Kernel Development: Introduction, Overview, Issues and development principles, case study.

UNIT V:

Protection, privacy, access control and security issues, solutions.

Text Books:

1. A. Silberschatz - Applied Operating System Concepts, Wiley, 2000.
2. Lubemir F Bic and Alan C. Shaw - Operating System Principles, Pearson Education, 2003.
3. Andrew S. Tanenbaum, "Distributed Operating Systems" ,PHI

References:

1. Operating Systems : Internal and Design Principles - Stallings, 6th ed., PE.
2. Modern Operating Systems, Andrew S Tanenbaum 3rd ed., PE.

3. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 7th ed.,, John Wiley
4. UNIX User Guide – Ritchie & Yates.
5. UNIX Network Programming - W.Richard Stevens ,1998, PHI.
6. The UNIX Programming Environment – Kernighan & Pike, PE.

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I Year – I Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(CNS11) ADVANCED DATA BASES

Course Objectives:

- Learn the modelling and design of databases.
- Acquire knowledge on parallel and distributed databases and its applications.
- Study the usage and applications of Object Oriented database
- Understand the principles of intelligent databases.

Course Outcomes:

- Demonstrate the emerging databases such as XML, Cloud and Big Data.
- Estimate the inquisitive attitude towards research topics in databases.
- Apply the knowledge of XML in designing the data bases.
- Develop the databases that are used in cloud and bigdata.

UNIT I:

Parallel and Distributed Databases:

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies.

UNIT II:

Object and Object Relational Databases: Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

UNIT III:

Intelligent Databases: Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications Design Principles for Active Rules- Temporal Databases: Overview of Temporal DatabasesTSQL2- Deductive Databases: Logic of Query Languages – Datalog- Recursive RulesSyntax and Semantics of Datalog Languages- Implementation of Rules and RecursionRecursive Queries in SQL- Spatial Databases- Spatial Data Types- Spatial RelationshipsSpatial Data Structures- Spatial Access Methods- Spatial DB Implementation.

UNIT IV:

Advanced Data Models: Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management -Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Multimedia Databases- Information Retrieval- Data WarehousingData Mining- Text Mining.

UNIT V:

Emerging Technologies:
XML Databases: XML-Related Technologies-XML Schema- XML Query Languages- Storing XML in Databases-XML and SQL- Native XML Databases- Web Databases- Geographic Information Systems- Biological Data Management- Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages, Introduction to Big Data-Storage-Analysis.

Text Books:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.

References:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database SystemConcepts", Fifth Edition, McGraw Hill, 2006.
2. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
3. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, Third Edition 2004.

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I Year – I Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(SWE25) INTERNET OF THINGS
(ELECTIVE-I)

Course Objectives:

- Introduce the current vision of the Internet of Things and its impact on the world.
- To provide an appreciation for the standardization of IoT protocols that is necessary for IoT to become reality.
- Implement IoT applications in real time scenario.

Course Outcomes:

Up on completion of the course the students should be able to

- Establish knowledge in a concise manner how the Internet of things work.
- Identify and interpret design methodology of IoT platform.
- Exhibit the knowledge of interfacing Python with embedded board- Raspberry Pi.
- Illustrate the Networking model of IoT

UNIT I:

Introduction to Internet of Things: Introduction, physical design of IoT, logical design of IoT-functional blocks, communicational models, communication APIs, IoT enabling technologies, IoT levels, deployment templates.

UNIT II:

Domain Specific IoTs: Introduction, home automation, cities, environment, energy, retail, logistics, agriculture, industry.

UNIT III:

Developing Internet of Things: Introduction, IoT design methodology, Case Study on IoT System for Weather Monitoring, Motivation for using Python.

UNIT IV:

Hardware and Software for IoT: Logical design using Python-data types, control flow, functions, packages, file handling, classes, Python packages of Interests for IoT

UNIT V:

IPv6 for Smart Object Networks and the Internet of the Things: Introduction, The depletion of the IPv4 address space, NAT : A solution to IPv4 Address Exhaustion, Architectural discussion.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A hands on approach, paperback-2014.
2. Jean- Philippe Vasseur, Adam Dunkels , Interconnecting Smart Objects with IP :The Next Internet . paperback-Import,2010

References:

1. Adrian Mcewen, Hakin Cassimally Designing the Internet of Things Paperback – 25 Jul 2015.

2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols Hardcover – Import, 6 Jan 2012.
3. .Keoh, Sye Loong, Sahoo Subhendu Kumar, and Hannes Tschofenig. "Securing the internet of things: A standardization perspective." *Internet of Things Journal, IEEE* 1.3 (2014): 265-275.
4. Ortiz, Antonio M., et al. "The cluster between internet of things and social networks: Review and research challenges." *Internet of Things Journal, IEEE* 1.3 (2014): 206-215.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

I Year – I Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(CSE04) SOFT COMPUTING
(ELECTIVE – I)

Course Objectives:

- Learning of the constituent parts of Soft Computing.
- Gain knowledge about the operators, classification & applications of Genetic Algorithms.
- Examine the concepts of neural networks in detail and understand the types of supervised and unsupervised learning networks and their respective functioning.
- Comprehend the purpose and usage of fuzzy sets.
- Study the construction and working of fuzzy inference and neuro-fuzzy systems

Course Outcomes:

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

- Infer the relevance and significance of Soft Computing.
- Propose an optimization model using Genetic Algorithms.
- Differentiate between the various supervised and unsupervised neural networks.
- Analyze and select an appropriate neural network for a specific problem.
- Design fuzzy membership functions and construct fuzzy logic control systems for simple applications

UNIT I:

Introduction to Soft Computing And Neural Networks: Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II:

Genetic Algorithms: Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition.

UNIT III:

Neural Networks: Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

UNIT IV:

Fuzzy Logic: Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions- Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems– Fuzzy Decision Making.

UNIT V:

Neuro-Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – Neuro-Fuzzy Control – Case studies.

Text Books:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995.
3. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Edn., 2003.

References:

1. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.
2. David E. Goldberg, “Genetic Algorithms in Search , Optimization and Machine Learning”, Addison Wesley, 1997.
3. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “ Introduction to Fuzzy Logic using MATLAB”, Springer, 2007.
4. S.N.Sivanandam · S.N.Deepa, “ Introduction to Genetic Algorithms”, Springer, 2007.
5. Jacek M. Zurada, “Introduction to Artificial Neural Systems”, PWS Publishers, 1992.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

I Year – I Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(CSE05) USE INTERFACE DESIGN
(ELECTIVE – I)

Course Objectives:

The goal of the course is for students to learn how to design, prototype, and evaluate user interfaces and applications using a variety of methods. Students should come away with an understanding of:

- how to study user tasks in context
- prototyping and testing initial versions of user interfaces
- the importance of iterative design in producing usable software
- the cognitive and perceptual constraints that affect interface design

Course Outcomes:

Successful completion of this course prepares students to demonstrate a Developing Proficiency toward the accomplishment of the following Program Learning Outcomes:

- Analysis, modelling, and problem solving. Students have the logical, algorithmic, and mathematical capability to model and analyse real-world problems in different application domains, to devise the problem-solving schemes accordingly, and to validate the correctness and effectiveness of the schemes.
- Foundational knowledge and practice of computing. Students have a solid understanding of the theoretical, the operational, and the implementation underpinnings of the modern computing infrastructure to be able to effectively utilize the whole spectrum of the modern computing infrastructure, including computer hardware, software, programming environments, operating systems, and networking environments.
- Programming and system integration. Students are capable of programming using mainstream programming languages, can conduct fine software-engineering practices to implement problem-solving schemes as correct, efficient, and well-structured programs, and can integrate the programs into the computing infrastructure as functional information systems.
- Interdisciplinary competency. Students are knowledgeable in related subject areas in business, engineering, science, or mathematics, and are capable of conducting interdisciplinary work by applying their knowledge and skills in computer science to these domains or applying their knowledge and skills in these domains to computer science.

UNIT I:

Introduction: Human–Computer Interface – Characteristics Of Graphics Interface –Direct Manipulation Graphical System – Web User Interface –Popularity –Characteristic & Principles.

UNIT II:

Human Computer Interaction: User Interface Design Process – Obstacles –Usability –Human Characteristics In Design – Human Interaction Speed –Business Functions –Requirement Analysis – Direct – Indirect Methods – Basic Business Functions – Design Standards – General Design Principles – Conceptual Model Design – Conceptual Model Mock-Ups

UNIT III:

Windows: Characteristics– Components– Presentation Styles– Types– Managements– Organizations– Operations– Web Systems– System Timings - Device– Based Controls Characteristics– Screen – Based Controls –– Human Consideration In Screen Design – Structures Of Menus – Functions Of Menus– Contents Of Menu– Formatting – Phrasing The Menu – Selecting Menu Choice– Navigating. Menus–Graphical Menus. Operate Control – Text Boxes– Selection Control– Combination Control– Custom Control– Presentation Control.

UNIT IV:

Multimedia: Text For Web Pages – Effective Feedback– Guidance & Assistance– Internationalization– Accessibility– Icons– Image– Multimedia – Coloring.

UNIT V:

Evaluation: Conceptual Model Evaluation – Design Standards Evaluation – Detailed User Interface Design Evaluation

Text Books:

1. Wilbent. O. Galitz ,"The Essential Guide To User Interface Design", John Wiley&Sons, 2001.
2. Deborah Mayhew, The Usability Engineering Lifecycle, Morgan Kaufmann, 1999Ben Shneiderman, "Design The User Interface", Pearson Education, 1998.

References:

1. Alan Cooper, "The Essential Of User Interface Design", Wiley – Dream Tech Ltd., 2002. Sharp,
2. Rogers, Preece, 'Interaction Design', Wiley India Edition, 2007

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I Year – I Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(CSE06) MACHINE LEARNING
(ELECTIVE –II)

Course Objectives:

- To understand the range of machine learning algorithms along with their strengths and weaknesses.
- To learn the concepts and applications of Artificial Neural Networks.
- To study functional aspects of Bayes theorem and Genetic algorithms.
- To appraise the different types of Learning.

Course Outcomes:

Upon successful completion of this course, students should be able to:

- Formulate solutions to problems using concept learning.
- Explore machine learning algorithms and tools used in data analysis.
- Justify the usage of Decision Trees and Neural Networks for specific applications.
- Apply Bayesian Learning techniques to research problems.
- Investigate and analyze the analytical approaches to learning..

UNIT I:

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

Concept Learning and the General to Specific Ordering: Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias

UNIT II:

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

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

Advanced topics in artificial neural networks

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

UNIT III:

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

Computational Learning Theory: Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning

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

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

UNIT IV:

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

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

UNIT V:

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

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

Text Books:

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

References:

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

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

I Year – I Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(CSE07) SOFTWARE PROJECT MANAGEMENT (ELECTIVE – II)

Course Objectives:

- Understand the basic concepts and issues of software project management
- Apply Create project plans that address real-world management challenges
- Match organizational needs to the most effective software development model
- Plan and manage projects at each stage of the software development life cycle (SDLC)

Learning Outcomes :

Upon completion of this course, students should be able to:

- Plan and manage projects at each stage of the software development life cycle (SDLC)
- Identify and describe the key phases of software project management.
- Develop a project management plan (PMP).
- Risk management & cost estimation.

UNIT I:

Basic Concepts: Product Process and project—Definition—product life Cycle—project Life cycle models—Process Models.

UNIT II:

Umbrella Activities: Metrics—software Configuration Management –Software Quality Assurance –Risk Management.

UNIT III:

In Stream Activities: Project initiation –Project Planning and Tracking—Project Closure

UNIT IV:

Engineering Activities in Project Life Cycle: Software requirement Gathering –Estimation—design and development Phases Project Management in the Testing & maintenance Phase

UNIT V:

Emerging Trends in Project Management: Globalization Issues in Project management – import of the internet on project Management - people Focused Process Models.

Text Books:

1. Ramesh Gopalaswamy ," Managing and global Software Projects", Tata Mc Graw Hill,2003.
2. Roger S.Pressman, "Software Engineering- A Practitioner's Approach ", 6th Edition, McGraw Hill, 1999.
3. Pankaj Jalote. Software Project Management in Practice. Addison-Wesley, 2002.

References:

1. Humphery Watts , " Managing the Software Process ", Addision Wesley , 1986
2. Wheelwright and Clark: " Revolutionizing product development ", The Free Press, 1993

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I Year – I Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(CSE08) PARALLEL AND DISTRIBUTED ALGORITHMS (ELECTIVE –II)

Course Objectives:

- To learn how to design parallel programs and how to evaluate their execution.
- To understand the characteristics, the benefits and the limitations of parallel systems and distributed infrastructures
- To study the technologies enabling parallel computing, different types of interconnection networks
- To study the different parallel programming models, software support needed for shared memory programming
- To learn message passing interface

Course Outcomes :

- Describe different parallel processing architectures based on relationships between processing elements, instruction sequence, memory and interconnected network
- Identify algorithms, which require parallelization as part of system design or performance enhancement
- Classify shared and distributed memory parallel systems according to their properties and usage models
- Design and develop parallel algorithms for shared and distributed memory models
- Evaluate the performance of parallel algorithms designed based on shared and distributed memory models as well as against serial based algorithm designs

UNIT I:

Basic Techniques, Parallel Computers for increase Computation speed, Parallel & Cluster Computing

UNIT II:

Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples

UNIT III:

Pipelining- Techniques computing platform, pipeline programs examples

UNIT IV:

Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallelist sharing data parallel programming languages and constructs, open MP

UNIT V:

Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.

Text Books:

1. Parallel Programming, Barry Wilkinson, Michael Allen, Pearson Education, 2nd Edition.
2. M.Sasikumar, Dinesh Shikhare, P.Ravi Prakash, “Introduction to Parallel Processing”. PHI. First Edition-2000.
3. Calvin Lin, Lawrence Snyder, “Principles of Parallel Programming” Pearson Education, First Edition-2009.

References:

1. Barry Wilkinson, Michael Allen, “Parallel Programming Techniques and applications using Networked Workstations and Parallel Computers” Pearson, 2nd edition.
2. Peter S. Pacheco, “An introduction to Parallel Programming” Morgan Kaufmann, 1st Edition.
3. Michael J. Quinn, “Parallel Programming in C with MPI and OpenMP”, Tata McGraw-Hill
4. Ananth Grama, Anshul Gupta, George Karypis and Vipin Kumar, "Introduction to Parallel Computing", Addison-Wesley, 2003. (Textbook)
5. Introduction to Parallel algorithms by Jaja from Pearson, 1992.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

I Year – I Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	0	**3**	**2**

(CSE51) ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

Course Objectives:

- Explain the data structures and their categories.
- Understanding of abstract data types and differentiate linear and non-linear data structures
- Advance understanding of stack, queue and their applications.
- Understanding of Searching and sorting techniques in real-world scenarios.
- Advance knowledge of graphs and tress and their applications.

Course Outcomes:

Understanding and applying the Techniques in Software Development Life cycle

- Apply fundamental knowledge of Data Structures in Real time applications.
- Develop a project based on Algorithms and Data Structures.
- Analyze and implement graphs and trees for real time applications.

Sample Problems on Data structures:

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

c) Quick sort f) Radix sort

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

17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.

18. Write a Java program that implements KMP algorithm for pattern matching.

References:

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

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

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

I Year- I Sem. M.Tech.. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	0	**0**	**4**

(CSE61) MINI PROJECT – I

A mini project work shall be carried out on any topic of Computer Science & Engineering and a seminar should be given on the same along with a brief report.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

I Year – II Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**1**	**4**

(CSE09) ADVANCED NETWORK PROGRAMMING

Course Objectives:

- Introduce the student to Unix/Linux kernel programming techniques. Teach advanced C systems programming and debugging techniques in a Unix/Linux environment
- Introduce the concepts of files and Directories to manage the Linux Environment through C Programming.
- Provide knowledge in working with the core operating systems Concepts Signals in Linux Environment
- Teach how to manage the Inter process communication by using the IPC techniques
- Introduce the student to socket programming and to manage the connections between client and server.

Course Outcomes:

At the end of this course, the student will be able:

- To Understand the Linux Operating system by commands and develop c programs.
- To Analyse the files and directories in Linux environment by developing C Applications
- To implement system programs to control the processes using signals.
- To Develop programs to provide Inter process communication to avoid classical IPC problems.
- To Design a client-server application using sockets and RPI.

UNIT I:

Linux Utilities- File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities.

Bourne again shell(bash) - Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples.

Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

UNIT II:

Files- File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown , fchown, links-soft links and hard links – symlink, link, unlink.

File and Directory management – Directory contents, Scanning Directories- Directory file APIs. Process- Process concept, Kernel support for process, process attributes, process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

UNIT III:

Signals- Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions. Interprocess Communication - Introduction to IPC mechanisms, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated

processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory.
Message Queues- Kernel support for messages, UNIX system V APIs for messages, client/server example.
Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.

UNIT IV:
Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example.
Network IPC - Introduction to Unix Sockets, IPC over a network, Client-Server model, Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented - Communication, Socket system calls for Connectionless-Communication, Example-Client/Server Programs- Single Server-Client connection, Multiple simultaneous clients, Socket options – setsockopt, getsockopt, fcntl.

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

Text Books:

1. Unix System Programming using C++, T.Chan, PHI.(Units II,III,IV)
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.(Unit I)
3. An Introduction to Network Programming with Java, Jan Graba, Springer, rp 2010.(Unit V)

References:

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

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I Year – II Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(CNS14) DISTRIBUTED SYSTEMS

Course Objectives:

- Summarize the fundamental architectures and distributed system models
- Discriminate conventional OS with distributed OS features
- Understand synchronization problems and Clock mechanisms
- Analyse various security issues in distributed environment cryptographic algorithms and fault tolerant mechanisms.

Course Outcomes:

- Analyse the problem with clock mechanisms in distributed environment
- Understand the concept of distributed transactions , distributed operating system
- Remember the concept of Fault Tolerant Mechanisms
- Apply various security algorithms

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

UNIT V:

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

Text Books:

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

References:

1. Distributed Computing, S.Mahajan and S.Shah, OxfordUniversity Press.
2. Distributed Operating Systems Concepts and Design, Pradeep K.Sinha, PHI.
3. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, and Tata McGraw-Hill Edition.
4. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
5. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani & MukeshSinghal, Cambridge, rp 2010

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I Year – II Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**1**	**4**

(SWE05) WEB SERVICES AND SERVICE ORIENTED ARCHITECTURE

Course Objectives:

1. To define and design applications as combinations of services, and be able to discuss the emergent properties of those compositions;
2. Understand concepts, technology and design of service orientation and web services
3. Analyzing and designing business based on SOA principles.
4. Understand Web Service Specifications and asses support by platforms like J2EE and .NET

Course Outcomes:

Upon completion of this course, students should be able to:

1. **Describe** SOA and Web Service Fundamentals and **build** Services with WS-* Specifications.
2. **Assess and realize** the service Layer Abstraction.
3. **Analyze and Design** the building an SOA.
4. **Examine** SOA support provided by J2EE and .NET platform

UNIT I:

Evolution of Distributed Computing: Core distributed computing technologies-client/server, CORBA, JAVA RMI, Microsoft DCOM, MOM, Challenges in Distributed Computing

Introduction to Web Services: The definition of web services, basic operational model of web services, Core Web Service Standards, benefits and challenges of using web services

SOA and Web Services Fundamentals

Introducing SOA: Fundamental SOA, Common Characteristics of Contemporary SOA, Common tangible benefits of SOA, Common pitfalls of adopting SOA.

The Evolution of SOA: An SOA timeline, The continuing evolution of SOA, The roots of SOA.

Web Services and primitive SOA: The Web Services frame work, Services, Service Descriptions, and Messaging.

UNIT II:

SOA and WS-* Extensions

Web Services and Contemporary SOA (Part-I): Message Exchange Patterns, Service Activity Coordination, Atomic transactions, Business Activities, Orchestration, and Choreography.

Web Services and Contemporary SOA (Part-II): Addressing, Reliable Messaging, Correlation, Policies, Metadata Exchange, Security, Notification and Eventing.

UNIT III:

SOA and Services - Orientation

Principles of Service-Orientation: Service - Orientation and the Enterprise, Anatomy of SOA, Common Principles of Service – Orientation, Interrelation between Principles of Service-Orientation, Service Orientation and Object Orientation, Native Web Services support for Principles of Service-Orientation. **Service Layers:** Service-Orientation and contemporary SOA, Service Layer abstraction, Application Service Layer , Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration Scenarios.

UNIT IV:

Building SOA (Planning and Analysis)

SOA Delivery Strategies: SOA delivery lifecycle phases, the top-down strategy, the bottom-up strategy, the agile strategy**.**

Service-Oriented Analysis (Part I-Introduction): Introduction to Service Oriented Analysis, Benefits of a Business-Centric SOA, Deriving Business Services.

Service Oriented Analysis (Part-II-Service Modelling): Service Modelling, Service Modelling guidelines, Classifying Service model logic, Contrasting Service modelling Approaches.

UNIT V:

Building SOA (Technology and Design)

Service Oriented Design (Part I-Introduction): Introduction to Service-Oriented Design, WSDL related XML Schema language basics. WSDL language basics, SOAP language basics, Service interface design tools.

Service Oriented Design (Part II-SOA Composition Guidelines): SOA Composing steps, Considerations for choosing service layers, Considerations for positioning core SOA standards, Considerations for choosing SOA extensions.

Service Oriented Design (Part III - Service Design): Service Design overview, Entity-centric business Service Design, Application Service Design, Task-centric business Service Design, Service Design guidelines.

Service Oriented Design (Part IV-Business Process Design): WS-BPEL language basics, WS-Coordination overview, Service Oriented Business process Design.

Fundamental WS-* Extensions: WS-Addressing language basics, WS-Reliable Messaging language basics, WS-Policy language basics, WS-Metadata Exchange language basics, WS-Security language basics.

SOA Platforms: SOA platform basics, SOA support in J2EE and .NET, Integration considerations.

Text Books:

1. Service-oriented Architecture: Concepts, Technology & Design, Thomas ERL, Pearson Edu.
2. Developing Java Web Services, r. Nagappan, r. Skoczylas, r.p. Sriganesh, wiley india.

References:

1. Web Services & SOA Principles and Technology, Second Edition, Michael P. Papazoglou
2. The Definitive guide to SOA, Jeff Davies & others, Apress, Dreamtech.
3. Understanding SOA with Web Services, Eric Newcomer, Greg Lomowand Pearson Education.
4. Java SOA Cook book, E. Hewitt, SPD.
5. SOA in Practice, N.M. Josuttis, SPD.

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I Year – II Sem. M.Tec.. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**1**	**4**

(SWE04) DATA ANALYTICS

Course Objectives:

1. To explore the fundamental concepts of big data analytics
2. To learn to analyze the big data using intelligent techniques.
3. To understand the applications using Map Reduce Concepts.
4. Explore on Big Data applications Using Pig and Hive
5. To understand the various search methods and visualization techniques.

Course Outcomes:

Upon Completion of the course, the students should be able to,

1. Work with big data platform and analyze the big data analytic techniques for useful business applications
2. Design efficient algorithms for mining the data from large volumes.
3. Learn to use various techniques for mining data stream.
4. Analyze the Hadoop and Map Reduce technologies associated with big data analytics

UNIT I:

Introduction To Big Data: Introduction to big data platform – challenges of conventional systems - web data – evolution of analytic scalability - analytic processes and tools - analysis vs reporting - modern data analytic tools - statistical concepts: sampling distributions - re-sampling - statistical inference - prediction error.

UNIT II:

Data Analysis: Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.

UNIT III:

Mining Data Streams, Frequent Itemsets And Clustering: Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window

Mining Frequent Itemsets - Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream – Clustering Techniques – Hierarchical – K-Means

UNIT IV:

Hadoop: History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFSBasics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

UNIT V:

Frameworks and Visualization: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services –HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper Visualizations - Visual Data Analysis Techniques - Interaction Techniques

Text Books :

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
4. Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.

Reference Books:

1. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
2. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
3. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008

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I Year – II Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(CSE10) STORAGE AREA NETWORKS
(ELECTIVE-III)

Course Objectives:

- To understand the necessity for storage area networks
- Differentiate among storage models, and describe the benefits of SANs
- Identify how to implement security measures in a SAN using zoning, Logical Unit Number (LUN) masking, and virtualization
- Identify components of a SAN and their roles

Course Outcomes:

- Designing, implementing, or managing storage in a SAN
- Learn the architecture and components of a SAN and the technological underpinnings that make SANs work.
- Apply these concepts in a series of on-line design activities that employ techniques such as Zoning to practice the consolidation of large amounts of data in a secure and highly available environment.
- Audit accounts and the database system.
- Back-up and Restore a database.

UNIT I:

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

UNIT II:

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

UNIT III:

Introduction to Networked Storage: Evolution of networked storage, Architecture, Components, and topologies of FC-SAN, NAS, and IP-SAN, benefits of the different networked storage options, Understand the need for long-term archiving solutions and describe how CAS fulfils the need. Understand the appropriateness of the different networked storage options for different application environments.

UNIT IV:

Information Availability & Monitoring & Managing Data Centre: List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, Differentiate between business continuity (BC) and disaster recovery (DR), RTO and RPO, Identify single

points of failure in a storage infrastructure and list solutions to mitigate these failures, Architecture of backup/recovery and the different backup/recovery topologies, replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities. Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center.

UNIT V:

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

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

Text Books:

1. EMC Corporation, Information Storage and Management, Wiley.
2. Robert Spalding, “Storage Networks: The Complete Reference”, Tata McGraw Hill, Osborne, 2003.
3. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne, 2001.

References:

1. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002.

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I Year – II Sem. M.Tech.. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(SWE16) CLOUD COMPUTING
(Elective -III)

Course Objectives:

- Understand cloud computing paradigm, recognize its various forms
- Get a clear understanding of Cloud Computing fundamentals and its importance to various organizations.
- Master the concepts of IaaS, PaaS, SaaS, Public and Private clouds.
- Understand AWS and learn to develop applications in AWS.

Course Outcomes:

Upon completion of this course, students should be able to:

1. Articulate the main concepts, key technologies, strengths, and limitations of cloud computing
2. Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
3. Explain the core issues of cloud computing such as security, privacy, and interoperability.
4. Identify problems, and explain, analyze, and evaluate various cloud computing solutions.

UNIT I:

Systems Modelling, Clustering and Virtualization: Distributed System Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Data centres.

UNIT II:

Foundations: Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era, the Enterprise Cloud Computing Paradigm.

UNIT III:

Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS)
Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service, Secure Distributed Data Storage in Cloud Computing. Aneka, Comet Cloud, T-Systems', Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments.

UNIT IV:

Monitoring, Management and Applications: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting Cloud Applications in the AWS cloud, Building Content Delivery networks using Clouds, Resource Cloud Mashups.

UNIT V:

Governance and Case Studies: Organizational Readiness and Change management in the Cloud age, Data Security in the Cloud, Legal Issues in Cloud computing, Achieving Production Readiness for Cloud Services.

Text Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing , Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 2012.
3. Cloud Computing : A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011

References:

1. Cloud Computing : A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
3. Cloud Computing: Implementation, Management and Security, John W. Rittinghouse, James F.Ransome, CRC Press, rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly, SPD, rp2011.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

I Year – II Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(CSE11) DATABASE SECURITY
(ELECTIVE-III)

Course Objectives:

- Understanding the key issues associated with protecting database assets
- Analyze the levels of protection and response to security incidents
- Synthesis a consistent, reasonable database security system

Course Outcomes:

On completion of this course a student should be able to:

- Build a risk analysis model for a large database.
- Implement identification and authentication procedures, fine-grained access control and data encryption techniques.
- Plan Audit accounts and the database system.
- Formulate methods for Back-up and Restore a database.

UNIT I:

Introduction: Introduction to Databases Security Problems in Databases Security Controls Conclusions

Security Models -1: Introduction Access Matrix Model Take-Grant Model Acten Model PN Model Hartson and Hsiao's Model Fernandez's Model Bussolati and Martella's Model for Distributed databases

UNIT II:

Security Models -2: Bell and LaPadula's Model Biba's Model Dion's Model Sea View Model Jajodia and Sandhu's Model The Lattice Model for the Flow Control conclusion.

Security Mechanisms: Introduction User Identification/Authentication Memory Protection Resource Protection Control Flow Mechanisms Isolation Security Functionalities in Some Operating Systems Trusted Computer System Evaluation Criteria

UNIT III:

Security Software Design: Introduction A Methodological Approach to Security Software Design Secure Operating System Design Secure DBMS Design Security Packages Database Security Design

UNIT IV:

Statistical Database Protection & **Intrusion Detection Systems:** Introduction Statistics Concepts and Definitions Types of Attacks Inference Controls evaluation Criteria for Control Comparison. Introduction IDES System RETISS System ASES System Discovery

UNIT V:

Models For The Protection Of New Generation Database Systems -1: Introduction A Model for the Protection of Frame Based Systems A Model for the Protection of Object-Oriented Systems SORION Model for the Protection of Object-Oriented Databases

Models For The Protection Of New Generation Database Systems -2: A Model for the Protection of New Generation Database Systems: the Orion Model Jajodia and Kogan's Model A Model for the Protection of Active Databases Conclusions

Text Books:

1. Database Security and Auditing, Hassan A. Afyouni, India Edition, CENGAGE Learning, 2009.
2. Database Security, *Castano,* Second edition, Pearson Education.

References:

1. Database security by alfred basta, melissa zgola, CENGAGE learning.

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I Year – II Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(CSE12) SEMANTIC WEB AND SOCIAL NETWORKS (ELECTIVE –IV)

Course Objectives:

- To learn Web Intelligence synthesize Knowledge Representation for the Semantic Web
- To define Ontology engineering and applications pertaining to it.
- To understand the essence of Semantic Web Applications, Services that promotes Semantic Web Technology
- To infer the principles of Social Network Analysis and correlate the rules with the semantic web

Course Outcomes:

Upon completion of this course, students should be able to:

- Evaluate principles of ontology and design inference engines in semantic web development
- Build semantic web applications with social network features
- Evaluate the social media and synthesize semantic web applications that mitigate
- Societal bad impacts and promote connectivity that enhances sharing.

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

UNIT V:

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

Text Books:

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.
3. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, R.Studer, P.Warren, John Wiley & Sons

References:

1. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
2. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
3. Programming the Semantic Web, T.Segaran, C.Evans, J.Taylor, O'Reilly, SPD

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

I Year – II Sem. M.Tech. (Computer Science &Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(CSE13) INFORMATION RETRIEVAL SYSTEMS
(ELECTIVE –IV)

Course Objectives:

- To outline basic terminology and components in information storage and retrieval systems
- To outline the structure of queries and documents
- To articulate fundamental functions used in information retrieval such as automatic indexing, abstracting, and clustering
- Learn the important concepts, algorithms, and data/file structures that are necessary to specify, design, and implement Information Retrieval (IR) systems.

Course Outcomes:

- Distinguish classical information retrieval models, identifying their principles, document models and measures used for evaluating similarity and retrieval systems.
- Recognize the Boolean Model, Vector Space Model, and Probabilistic Model.
- Clearly separate the indexing and search modules in information retrieval tools
- For a document collection and a retrieval task, create an appropriate document model and specify automatic methods for processing the documents
- Relate textual information retrieval with its extensions to voice and image, identifying the open problems.

UNIT I:

Boolean retrieval. The term vocabulary and postings lists. Dictionaries and tolerant retrieval. Index construction. Index compression.

UNIT II:

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

UNIT III:

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

UNIT IV:

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

UNIT V:

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

Text Books:

1. Introduction to Information Retrieval , Christopher D. Manning and Prabhakar Raghavan and Hinrich Schütze, Cambridge University Press, 2008.
2. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark T Maybury, Springer.
3. Modern Information Retrieval, Ricardo Baeza-Yates, Pearson Education, 2007.

References:

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

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I Year – II Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	3	**0**	**3**

(SWE24) RESEARCH METHODOLOGY
(Elective IV)

Course Objectives:

1. Identify an appropriate research problem in their interesting domain.
2. Organize and conduct research project.
3. Prepare a research project thesis report.

Course Outcomes:

Up on completion of the course the students should be able to

1. Identify and implement the activities according to the research process.
2. Select and apply the appropriate research design for a problem.
3. Apply the estimation techniques, Chi-Square test and ANOVA technique.
4. Prepare Research thesis report and proposals in specific domains

UNIT I:

Introduction: Research objective and motivation, Types of research, Research approaches, Significance, Research method vs. methodology, Research process

UNIT II:

Formulating A Research Problem: Literature review, Formulation of objectives, Establishing operational definitions, Identifying variables, Constructing hypotheses

UNIT III:

Research Design and Data Collection: Need and Characteristics, Types of research design, Principles of Experimental research design, Method of data collection, Ethical issues in collecting data

UNIT IV:

Sampling And Analysis Of Data: Need of Sampling, Sampling distributions, Central limit theorem, Estimation: mean and variance, Selection of sample size Statistics in research, Measures of Central tendency, Dispersion, asymmetry and relationships, Correlation and Regression analysis, Displaying data

UNIT V:

Hypothesis Testing: Procedure, Hypothesis testing for difference in mean, variance limitations,Chi-square test, Analysis of variance (ANOVA), Basic principles and techniques of Writing a Research proposal

Text Books:

1. R. C. Kothari, Research Methodology: Methods and Techniques, 2nd edition, New Age International Publisher, 2009
2. Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, 2nd Edition, SAGE, 2005

References:

1. Trochim, William M. The Research Methods Knowledge Base, 2nd Edition. Internet WWW page, at URL: <http://www.socialresearchmethods.net/kb/> (version current as of October 20, 2006).
2. (Electronic Version): StatSoft, Inc. (2012). Electronic Statistics Textbook. Tulsa, OK:
3. StatSoft. WEB: http://www.statsoft.com/textbook/. (Printed Version): Hill, T. & Lewicki, P. (2007). STATISTICS: Methods and Applications. StatSoft, Tulsa, OK.

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I Year – II Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	0	**3**	**2**

(CSE52) WEB SERVICES AND DATA ANALYTICS LAB

Course Objectives:

The course objectives of web Services laboratory is to:

- Understand the use of web services in B2C and B2B applications.
- Understand the design principles and application of SOAP and REST based web services.
- Design collaborating web services according to a specification. Implement an application that uses multiple web services in a realistic business scenario.
- Use industry standard open source tools such as Apache Axis2, Tomcat, Derby and Eclipse to build, test, deploy and execute web services and web applications that consume them.

Course Outcomes:

Upon successful completion of this course, a student will be able to

- Design and launch Web services.
- Generate their own programs from the Web services published by others.
- Evaluate the publish, find, bind architecture for Web services and to use the corresponding standards, in particular, Web Services Description Language (WSDL), Simple Object Access Protocol (SOAP), and Universal Description, Discovery and Integration (UDDI).

List of Programs:

1. Write a program to implement WSDL Service (Hello Service . WSDL File)
2. Write a program the service provider can be implement a single get price(), static bind() and get product operation.

3. Write a program to implement the operation can receive request and will return a response in two ways.
   a) One-Way operation

   b) Request - Response
4. Write a program to implement to create a simple web service that converts the temperature from Fahrenheit to Celsius (using HTTP Post Protocol)
5. Write a program to implement business UDDI Registry entry
6. Write a program to implement
   a) Web based service consumer
   b) Windows application based web service consumer

Data Analytics Programs

1. Data Analytics overview and Data Analytics life cycle.

2. Basic Data Analytic methods using R
   - Introduction to R – look at the data
   - Analyzing and Exploring the Data

- Statistics for Model Building and Evaluation

3. Advanced Analytics
    - K-means clustering
    - Association rules
    - Linear Regression
    - Naïve Bayes
    - Decision Trees
4. Advanced Analytics
    - Analytics for Unstructured Data (MapReduce and Hadoop)
    - The Hadoop Ecosystem
    - No SQL
    - Data Visualization Techniques

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I Year- II Sem. M.Tech. (Computer Science & Engineering)	**L**	**T/P/D**	**C**
	0	**0**	**4**

(CSE62) MINI PROJECT – II

A mini project work shall be carried out on any topic of Computer Science & Engineering and a seminar should be given on the same along with a brief report.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY, HYDERABAD

II Year – I Sem. M.Tech. (Computer Science & Engineering)

L	T/P/D	C
0	0	4

(CSE 63) COMPREHENSIVE VIVA-VOCE

II Year – I Sem. M.Tech.. (Computer Science & Engineering)

L	T/P/D	C
0	0	8

(CSE71) INTERNSHIP / DISSERTATION PHASE- I

II Year – II Sem. M.Tech. (Computer Science & Engineering)

L	T/P/D	C
0	0	18

(CSE72) DISSERTATION PHASE - II