ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING

Department of Computer Science and Engineering

M.Tech Two Year Degree Course

(Applicable for the batches admitted from 2014-15)

GUDLAVALLERU ENGINEERING COLLEGE

(An Autonomous Institute with Permanent Affiliation to JNTUK, Kakinada)

Seshadri Rao Knowledge Village

GUDLAVALLERU - 521 356, Krishna District, Andhra Pradesh

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ACADEMIC REGULATIONS

M.Tech - Computer Science and Engineering

ACADEMIC REGULATIONS

1. Duration of the Program

The duration of the program is two academic years consisting of four semesters. However, a student is permitted to complete the course work of M.Tech program in the stipulated time frame of **FOUR** years from the date of joining.

2. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

3. Program Credits

Each specialization of the M.Tech programs is designed to have a total of 80 credits and the student shall have to complete the two year course work and earn all the 80 credits for the award of M.Tech Degree.

4. Attendance Regulations

4.1 A student shall be eligible to appear for End Semester Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

4.2 Condoning of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester will be considered for genuine reasons such as medical grounds and participation in co-curricular and extra-curricular activities and shall be granted only after approval by a committee duly appointed by the college. Student should submit application for medical leave along with medical certificate from a registered medical practitioner within three days from reporting to the class work after the expiry of the medical leave. In case of participation in co-curricular and extra-curricular activities, either in the college or other colleges, students must take prior written permission from HoD concerned and should also submit the certificate of participation from the organizer of the event within three days after the completion of the event. Only such cases will be considered for condoning attendance shortage.

4.3 A student shall be eligible to claim for condonation of attendance shortage only once during the two years (four semesters) course work.

4.4 A student will not be promoted to the next semester unless he satisfies the attendance requirement of the current semester. He may seek re-admission for that semester when offered next.

4.5 Shortage of Attendance below 65% in aggregate shall in *NO* case be condoned.

4.6 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that semester and their registration shall stand cancelled.

4.7 A fee stipulated by the college shall be payable towards condoning attendance shortage.

5. Examinations and Scheme of Evaluation

5.1 Theory Courses:

Each theory course shall be evaluated for a total of 100 marks, consisting of 40 marks for internal assessment and 60 marks for semester end examination.

***Internal Assessment*:**

i) Out of 40 marks for internal assessment, 20 marks are for continuous assessment in the form of assignment and seminar and 20 marks are based on two mid-term examinations.

ii) Of the 20 marks for continuous assessment, 10 marks each for assignment and seminar.

iii) Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of four questions, each for 10 marks. All the questions need to be answered.

iv) Sum of the 75% marks of best scored mid-term examination and 25% marks of other mid-term examination are scaled down for 20 marks.

***External Assessment*:**

Semester End Examination will have 8 questions, each for 12 marks, out of which 5 questions are to be answered.

5.2 Laboratory Course:

i) For practical subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examinations. There shall be continuous evaluation by the internal subject teacher during the semester for 40 internal marks. Of the 40 marks for internal, 30 marks shall be for day-to-day performance (20 marks for day-to-day evaluation and 10 marks for Record) and 10 marks for an internal laboratory test conducted towards the end of semester.

ii) Semester End examination shall be conducted by the teacher concerned and external examiner for 60 marks.

5.3 Seminar:

For seminar, a student under the supervision of a faculty member, shall collect the literature on an advanced topic related to his specialization and critically review the literature and submit it to the department in a report form two weeks before the end of the 3rd semester and shall make an oral presentation before the Departmental Review Committee consisting of the supervisor and a senior faculty member / Head of the Department. There

shall be an internal evaluation for 50 marks in the form of viva-voce examination and assessment of report and its presentation. There will be NO external evaluation.

If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of 4th semester or subsequent semesters. He has to submit a fresh report two weeks before the end of that semester and appear for the evaluation by the committee.

5.4 Comprehensive Viva-Voce:

Comprehensive Viva-Voce examination is conducted for 50 marks at the end of third semester in all the subjects of first two semesters of the course by a committee consisting of two senior faculty members of the department. There will be NO external evaluation.

If a candidate fails to secure the minimum marks prescribed for successful completion, he has to re-register by paying the prescribed fee at the beginning of 4th semester or subsequent semesters and undergo Viva-Voce examination towards the end of that semester.

5.5 Project Work:

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

i) A Project Review Committee (PRC) shall be constituted for each specialization with Head of the Department as Chairman and two other senior faculty members.

ii) Registration of Project Work: A candidate who has been promoted to 3rd semester shall be eligible to register for the project work.

iii) The eligible candidate can choose his project supervisor and submit the title, objective, abstract and plan of action of the proposed project work to the department for approval by the PRC. The candidate whose proposal is approved by the PRC shall register for the project work. The minimum duration of project work will be 36 weeks from the date of registration.

iv) If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. In case of such changes, the candidate has to register afresh.

v) There shall be three reviews on the progress of the project work by the PRC with an interval of 12 weeks. The candidate needs to submit a report on the progress of his work and present it before the PRC for assessment. The PRC may suggest for an extension of date of submission of dissertation if the progress of work is not satisfactory or absent himself for the review.

vi) A candidate who has passed all the theory, laboratory, seminar and comprehensive viva-voce examinations and shown satisfactory progress of project work is permitted to submit the dissertation after 36 weeks from the date of registration.

vii) If a candidate fails to submit the dissertation by the end of the 4th semester, he has to take the permission for an extension by paying the semester(s) tuition fee.

viii) Three copies of the Project Thesis certified by the supervisor shall be submitted to the Department.

ix) Project evaluation and Viva-Voce examination is conducted at the end of 4th semester by a committee consisting of Project Supervisor, senior faculty of the department, HoD and an External Examiner nominated by the Chief Controller of Examinations out of a panel of three examiners suggested by the department.

The following grades are awarded for the project work:

i. Excellent
ii. Very Good
iii Good
iv. Satisfactory
v. Unsatisfactory

The Grade “unsatisfactory” is treated as Fail. Failed Students should take supplementary examination after making required modifications, if any, in the dissertation with a minimum gap of 8 weeks by paying the required examination fee.

6. Criteria for Passing a Course and Award of Grades:

6.1 Criteria for Passing a Course:

i) A candidate shall be declared to have passed in individual theory/ drawing / design course / laboratory if he secures a minimum of 50% aggregate marks (internal & semester end examination marks put together), subject to securing a minimum of 40% marks in the semester end examination.

ii) The candidate shall be declared to have passed in seminar / comprehensive viva-voce if he secures 50% marks.

iii) The candidate shall be declared to have successfully completed the project work if he secures a minimum of ‘satisfactory’ grade in the project evaluation and viva-voce examination.

iv) On passing a course of a program, the student shall earn assigned credits in that course.

6.2 Method of Awarding Letter Grade and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on his performance, as per the grading system given below.

Theory Course (%)	Laboratory (%)	Grade Points	Letter Grade
³ 90	³ 90	10	S
³ 80 & < 90	³ 80 & < 90	9	A
³ 70 & < 80	³ 70 & < 80	8	B
³ 60 & < 70	³ 60 & < 70	7	C
³ 50 & < 60	³ 50 & < 60	6	D
< 50	< 50	0	F (Fail)

S : Outstanding **A** : Excellent **B** : Very Good
C : Good **D** : Fair

6.3 Calculation of Semester Grade Point Average (SGPA)* for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as given below:

SGPA = $\frac{\sum(CR \times GP)}{\sum CR}$ for each semester.

where CR = Credits of a course
GP = Grade Points awarded for a course

* SGPA is calculated for a candidate who passed all the courses in that semester.

6.4 Eligibility for Award of M.Tech Degree:

A student will be declared eligible for the award of the M.Tech Degree if he fulfills the following academic regulations.

(a) Pursued a course of study for not less than two academic years and not more than four academic years.

(b) Registered for **80** credits and secured all **80** credits.

(c) Students, who fail to complete their Two years Course of study within Four years or fail to acquire the **80** Credits for the award of the degree within four academic years from the year of their admission shall forfeit their seat in M.Tech course and their admission shall stand cancelled.

6.5 Calculation of Cumulative Grade Point Average (CGPA)* for Entire Program:

The CGPA is calculated as given below:

CGPA = $\frac{\sum(CR \times GP)}{\sum CR}$ for entire program.

where CR = Credits of a course
GP = Grade points awarded for a course

* CGPA is calculated for a candidate who passed all the prescribed courses excluding project work.

6.6 Award of Division:

After satisfying the requirements prescribed for the completion of the program, the student shall be eligible for the award of M.Tech Degree and shall be placed in one of the following grades:

CGPA	Class	Letter Grade	Description
³ 7.5	First Class with Distinction	A	Excellent
³ 6.5 & < 7.5	First Class	B	Good
³ 6.0 & < 6.5	Second Class	C	Fair

7. Supplementary Examinations :

i) Supplementary examinations will be conducted once in a year along with regular examinations.

ii) Semester end supplementary examinations shall be conducted till next regulation comes into force for that semester after the conduct of the last set of regular examinations under the present regulation.

iii) Thereafter supplementary examinations will be conducted in the equivalent courses as decided by the Board of Studies concerned.

8. Readmission Criteria :

A candidate, who is detained in a semester due to lack of attendance has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling the required norms stipulated by the college and by paying the required tuition fee and special fee in addition to paying an administrative fee of Rs. 1,000/-.

9. Break in Study :

Student, who discontinues the studies for what-so-ever reason, can get readmission into appropriate semester of M.Tech program only with the prior permission of the Principal of the College, provided such candidate shall follow the transitory regulations applicable to the batch he joins. An administrative fee of Rs.2,000/- per each year of break in study, in addition to the prescribed tuition and special fees should be paid by the candidate to condone his break in study.

10. Transitory Regulations:

A candidate, who is detained or discontinued in a semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semester(s) he was originally admitted into and he will be offered

substitute subjects in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

10.1 A student who is following JNTUK curriculum and detained due to shortage of attendance at the end of the first semester of first year shall join the autonomous batch of first year first semester. Such students shall study all the courses prescribed for the batch in which the student joins and considered on par with regular candidates of Autonomous stream and will be governed by the autonomous regulations.

10.2 A student who is following JNTUK curriculum, detained due to shortage of attendance at the end of the second semester of first year shall join with the autonomous batch in the second semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in place of them as decided by the Board of Studies. The student has to clear all his backlog subjects of first semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree. The total number of credits to be secured for the award of the degree will be sum of the credits of first semester under JNTUK regulations and the credits prescribed in second semester in which a candidate seeks readmission and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

11. Withholding of Results

If the student has not paid the dues, if any, to the College or if any case of indiscipline is pending against him, his examinations results and degree will be withheld.

12. Malpractices :

i) The Principal shall refer the cases of malpractices in internal assessment tests and semester end examinations to a malpractice enquiry committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the erring students based on the recommendations of the committee.

ii) Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder.

DISCIPLINARY ACTION FOR MALPRACTICES/IMPROPER CONDUCT IN EXAMINATIONS

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

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for the examinations of the remaining subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

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

8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidate is also debarred and forfeits the seat.
9	If student of the college who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clauses 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the police and a police case is registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester examinations.

12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be referred to the Chief Superintendent of Examinations for future action towards suitable punishment.

iii) The involvement of the staff, who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents related to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and appropriate disciplinary action will be taken after thorough enquiry.

13. Other Matters

i) Physically challenged candidates who have availed additional examination time and a scribe during their BE / B.Tech or equivalent examinations will be given similar concessions on production of relevant proof/ documents. Students who are suffering from contagious diseases are not allowed to appear either for internal or semester end examinations.

ii) The students who participated in coaching / tournaments held at State / National / International levels through University / Indian Olympic Association during semester end external examination period will be promoted to subsequent semesters as per the guidelines of University Grants Commission Letter No. F.1-5/88 (SPE/PES), dated 18-08-1994.

iii) The Principal shall deal in an appropriate manner with any academic problem which is not covered under these rules and regulations, in consultation with the Heads of the Departments and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the Departments shall be reported to the Academic Council for ratification.

14. General

i) The Academic Council may, from time to time, revise, amend or change the regulations, schemes of examination and /or syllabi.

ii) The academic regulations should be read as a whole for the purpose of any interpretation.

iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of the Academic Council is final.

iv) Wherever the word he, him or his occurs, it will also include she, her and hers.

COURSE STRUCTURE

&

SYLLABUS

M.Tech - Computer Science and Engineering

COURSE STRUCTURE

I Semester

Sl. No.	Name of the Course / Laboratory	No.of Periods per week		No.of Credits
		L	P	
1	Data Structures and Algorithm Analysis	4	-	3
2	Database Management Systems	4	-	3
3	Advanced Computer Architecture	4	-	3
4	Distributed Systems	4	-	3
5	Elective - I	4	-	3
6	Elective - II	4	-	3
7	Software Lab - I	-	6	3
	Total	**24**	**6**	**21**

II Semester

Sl. No.	Name of the Course / Laboratory	No.of Periods per week		No.of Credits
		L	P	
1	Wireless Networks	4	-	3
2	Data Mining and Data Warehousing	4	-	3
3	Cryptography and Network Security	4	-	3
4	Object Oriented Software Engineering	4	-	3
5	Elective - III	4	-	3
6	Elective - IV	4	-	3
7	Software Lab - II	-	6	3
	Total	**24**	**6**	**21**

III Semester

Sl. No.	Name of the Course / Laboratory	No.of Credits
1	Seminar	2
2	Comprehensive Viva-Voce	2
3	Dissertation (Initiated in third semester)	-
	Total	**4**

IV Semester

Sl. No.	Name of the Course / Laboratory	No.of Credits
1	Dissertation (Carried out in third & fourth semesters)	34
	Total	**34**

Electives:

I Semester	II Semester
Elective - I	**Elective - III**
E-Commerce	Human Computer Interface
Mobile Computing	Artificial Intelligence
Computer Forensics	Big Data
Elective - II	**Elective - IV**
Performance Evaluation of Computer Systems	Cloud Computing
Software Project Management	Big-Informatics
Digital Image Processing	Parallel Computing

SYLLABUS

DATA STRUCTURES AND ALGORITHM ANALYSIS

I – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To familiarize with various types of data structures.
- To gain knowldege the performance of algorithms.

Learning Outcomes:

Students will be able to

- develop and implement algorithms for various data structures.
- choose appropriate data structure for a given problem.
- analyze the performance of the algorithms.
- apply suitable sorting and searching technique to solve the given problem.

UNIT I:

Preliminaries of algorithm analysis- Time and Space Complexity, asymptotic notations, introduction to Data Structures, Singly Linked Lists, Doubly Linked Lists, Circular Lists-agorithms.

Stacks and Queues- Algorithm implementation using Linked Lists.

UNIT II:

Searching - Linear and Binary search methods

Sorting- Quick Sort, Merge Sort, Multi way merge sort, poly phase merge sort
Trees- Binary trees, properties, representation and traversals (DFT, BFT), expression Trees (Infix, prefix, postfix).
Graphs - Basic concepts, storage structures and traversals.

UNIT III:

Dictionaries, ADT, the List ADT, Stack ADT, Queue ADT, Hash Table representation, Hash functions,
Collision Resolution-Separate Chaining, **Open Addressing**-Linear Probing, Double Hashing.
Priority queues- Definition, ADT, realizing a Priority Queue using Heaps, definition, insertion, deletion

UNIT - IV:

Search Trees-1- Binary Search Trees, definition, ADT, implementation, **Operations**-searching, insertion, deletion.
AVL Trees- Definition, height of AVL Tree, **Operations-** insertion, deletion and searching, 2-3 trees- operations.

UNIT - V:

Search Trees-2- Introduction to Red-Black and Splay Trees, B-Trees, height of B-Tree, insertion, deletion and searching, comparison of search trees.

Text Books:

1. Allen Weiss, "Data structures and Algorithm Analysis in C++", Second edition, Pearson education.
2. Ellis Horowitz, Satraj Sahni and Rajasekharam,"Fundamentals of Computer Algorithms", Galgotia publications pvt. Ltd.
3. Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tanenbaum, "Data Structures using C and C++", 2nd Edition,.

References:

1. Richard F Gilberg, Behrouz A Forouzan,"Data Structures,-A Pseudocode Approach", Cengage publications.
2. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai,"Introduction to Design and Analysis of Algorithms A strategic approach",Mc Graw Hill.

DATABASE MANAGEMENT SYSTEMS

I – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To provide the background to design, implement and use database management system.

Learning Outcomes:

Students will be able to

- differentiate database systems from file systems by enumerating the features provided by the database system.
- describe fundamental elements of a database management system.
- design entity relationship diagrams to represent simple database application scenarios.
- convert entity relationship diagrams into relational tables, populate a relational database and formulate SQL queries on the data.
- criticize a database design and improve the design by normalization.
- interpret the basic issues of transaction processing and concurrency control.

UNIT I:

Introduction to Database

Purpose of Database Systems, Data models, Schema and instances, DBMS architecture, Entity- Relationship model- Attributes and Keys, Relationship types, Weak Entity set, Strong Entity Set, enhanced E–R Modeling- Specialization and generalization, Database design for Banking enterprise, reduction to relational schemas

UNIT II:

Relational Model & SQL

Relational model concepts, constraints, relational algebra, SQL- DDL, DML, DCL, Set operations, Aggregate functions, Null values, nested queries, defining different constraints on a table, creating Views and indices.

UNIT III:

Database Design-Functional dependencies and normalization for relational databases: informal design guidelines for relation schemes, functional dependencies, **Normal forms:** First, second and third normal forms, Boyce-Cod normal form, Multi valued & Join Dependencies, 4th & 5th normal forms.

UNIT IV:

Transaction Management- Transaction concept, ACID properties, schedules and recoverability, serializability of schedules

Concurrency control- Concurrent execution of transactions, Lock-based protocols, Timestamp-based protocols, multiple granularities locking, Deadlock handling

UNIT V:

Crash Recovery- Failure classification, different types of Recovery techniques-deferred update, immediate update, Shadow paging, Check points, media recovery,

Indexing: Order indices, multi level indices, dynamic multilevel indices using B trees and B+- Trees.

Text Books

1. Korth & Sudarshan, "Database system concept", sixth edition,McGraw-Hill.
2. Raghu Ramakrishnan, Johannes Gehrke,"Database Management Systems", McGraw-Hill.

Reference Books:

1. Peter Rob & C Coronel , "Database Systems design, Implementation, and Management", Cengage Learning,7th Edition.
2. Elmasri Navate, "Fundamentals of Database Systems" , Pearson Education
3. C.J.Date, "Introduction to Database Systems", Pearson Education

ADVANCED COMPUTER ARCHITECTURE

I – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To impart knowledge on advanced design issues of computer architecture.

Learning Outcomes:

Students will be able to

- apply appropriate addressing mode for increasing the level of parallelism.
- choose appropriate software or hardware techniques for parallelism.
- design a strategy for reducing the cache miss rate.
- analyze various problems associated with interconnecting networks.

UNIT I:

Fundamentals of Computer design, technology trends, cost, measuring and reporting performance quantitative principles of computer design.

UNIT II:

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

UNIT III:

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

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

UNIT IV:

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

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

UNIT - V:

Storage systems, Types , Buses , RAID, errors and failures, bench marking a storage device, designing a I/O system.

Inter connection networks and clusters, interconnection network media, practical issues in interconnecting networks, examples, clusters- designing a cluster.

Text Books:

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

Reference Books:

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

DISTRIBUTED SYSTEMS

I – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To familiarize with the concepts of distributed computing systems.

Learning Outcomes:

Students will be able to

- understand the concepts of Distributed Systems
- design a strategy to overcome the effects of deadlock.
- analyze the working of various algorithms used to achieve synchronization.
- implement distributed file system to solve relevant problems.

UNIT I:

Introduction to Distributed Systems- Goals of Distributed System, hardware and software concepts, design issues

Communication in Distributed Systems- Layered protocols, ATM networks, Client-Server model, Remote Procedure Call, group communication

UNIT II:

Synchronization in Distributed Systems- Clock synchronization, mutual exclusion, election algorithms: Bully algorithm, Ring algorithm, atomic transactions.

UNIT III:

Deadlocks- Deadlocks in distributed systems, distributed deadlock prevention, and distributed deadlock detection

Processes- Processes in distributed systems. threads, system models, processor allocation, scheduling in distributed system, fault tolerance and real time distributed systems.

UNIT IV:

Distributed File Systems- Design, implementation, trends

UNIT V:

Distributed Shared Memory- What is shared memory, consistency models, page based distributed shared memory, shared variable distributed memory, object based DSM

Text Books:

1. Andrew S. Tanenbaum,"Distributed Operating Systems ", Prentice Hall
2. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems Concepts and Design" , 2 nd edition, Pearson.

Reference Books:

1. Andrew S. Tanenbaum, Maarten Van Steen,"Distributed Systems principles and paradigms" , Pearson Prentice Hall

Elective - I

E - COMMERCE

I – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To familiarize the basic and advanced functions of e-commerce software

Learning Outcomes:

Students will be able to

- analyze the risks involved in e-payment systems
- analyze the reasons for adoption of e-commerce and e-business.
- analyze the business challenges related to e-business and e-commerce for an organisation.
- design an e-business application.

UNIT I:

Electronic Commerce-Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. consumer oriented electronic commerce, Mercantile Process models.

UNIT II:

Electronic payment systems - Digital token-based, smart cards, credit cards, risks in electronic payment systems.

Inter Organizational Commerce - EDI, EDI implementation, value added networks.

UNIT III:

I**ntra Organizational Commerce** - work flow, automation customization and internal commerce, supply chain management.

UNIT IV: .

Corporate Digital Library - Document library, digital document types, corporate data warehouses. advertising and marketing, information based marketing, advertising on internet, on-line marketing process, market research.

UNIT V:

Consumer search and Resource discovery - Information search and retrieval, commerce catalogues, information filtering, multimedia, key multimedia concepts, digital video and electronic commerce, desktop video processings, desktop video conferencing.

Text Books:

1. Kalakata, Whinston, "Frontiers of electronic commerce" , Pearson.

Reference Books:

1. Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley, "E-Commerce fundamentals and applications" .
2. S.Jaiswal,"E-Commerce", Galgotia.
3. Efrain Turbon, Jae Lee, David King, H.Michael Chang,"E-Commerce", .
4. Gary P.Schneider & Thomson,"Electronic Commerce".
5. Kenneth C.Taudon, Carol Guyerico Traver,"E-Commerce: Business", Technology, Society, 4th edition .

Elective - I

MOBILE COMPUTING

I – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To gain knowledge about system and application software for Mobile node.

Learning Outcomes:

Students will be able to

- apply various multiplexing techniques for providing services to users.
- design an appropriate database for providing better services.
- analyze various protocols of wireless networks.
- design a MANET with high security and low power consumption.

UNIT - I:

Mobile Computing (MC) : Introduction to MC, novel applications, limitations, and architecture.

GSM- Mobile services, system architecture, radio interface, protocols, localization and calling, handover, security, and new data services.

(Wireless) Medium Access Control - Motivation for a specialized MAC (hidden and exposed terminals, near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT - II:

Mobile Network Layer- Mobile IP (goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), dynamic host configuration protocol (DHCP).

Mobile Transport Layer - Traditional TCP, indirect TCP, snooping TCP, mobile TCP, fast retransmit/fast recovery, transmission /time-out freezing, selective retransmission, transaction oriented TCP.

UNIT - III:

Database Issues- Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

UNIT - IV:

Data Dissemination- Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

Mobile Ad hoc Networks (MANETs)- Overview, properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

UNIT - V:

Protocols and Tools- Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (user scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

Text Books:

1. Jochen Schiller,"Mobile Communications",Addison-Wesley, second edition, 2004.
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", *Wiley*, 2002.

Reference Books:

1. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Cambridge University Press, October 2004,
2. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional, 2005.
3. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", *S*pringer, 2nd edition, 2003.
4. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003.

Elective - I

COMPUTER FORENSICS

I – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To understand computer forensics workstations and software for beginning an investigation on case.
- To understand the rules of Digital evidence and acquisition tools to investigate case
- To understand computer forensics tools and analyze what data to be used in computer forensics investigation

Learning Outcomes:

Students will be able to

- understand security precautions
- acquire data using different Data acquisition methods
- apply various forensics tools for solving a case using digital evidence.
- analyze data using Forensic Tools

UNIT - I:

Computer forensics and investigations- Understanding computer forensics, preparing for computer investigations, taking a systematic approach, procedure for corporate high-tech investigations, understanding data recovery workstations and software.

UNIT - II:

Investor's office and laboratory- Understanding forensics lab certification requirements, determining the physical requirements for a computer forensics lab, selecting a basic forensic workstation.

UNIT - III:

Data Acquisition- Understanding storage formats for digital evidence, determining the best acquisition method, contingency planning for image acquisitions, using acquisition tools, validating data acquisition, performing RAID data acquisition, using remote network acquisition tools, using other forensics acquisition tools.

UNIT - IV:

Processing crime and incident scenes- Identifying digital evidence, collecting the evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime, sizing digital evidence at the scene, storing digital evidence, obtaining a digital hash.

UNIT - V:

Current computer forensics tools- Evaluating computer forensics tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software.

Computer forensics analysis and validation- Determining what data to collect and analyze, validating forensics data, addressing data-hiding techniques, and performing remote acquisition. email and mobile device forensics.

Text Books:

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

Reference Books:

1. Tommy Whitlock,"Guide to Computer Forensics & Investigations", 4th Edition
2. Computer Forensics (US-CERT): http://learn.canterbury.ac.nz/mod/resource/view.php?id=139624
3. An Overview of Computer Forensics: http://learn.canterbury.ac.nz/mod/resource/view.php?id=139631

Elective - II

PERFORMANCE EVALUATION OF COMPUTER SYSTEMS

I – Semester

Practical	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To gain knowledge about the techniques of evaluating the performance of computing systems.

Learning Outcomes:

Students will be able to

- evaluate the performance of computing systems using appropriate performance metrics.
- evaluate discrete and continuous systems.
- represent the data in various forms.
- develop simulation models for various systems.

UNIT - I:

Performance Evaluation - Performance analysis, performance measurement; a systematic approach to performance evaluation.
Selection of techniques and metrics- selecting an evaluation technique, selecting performance metrics, commonly used performance metrics, utility classification of performance metrics, setting performance requirements.
review of probability concepts, characteristics of commonly used distribution.

UNIT - II:

Art of data presentation- Types of variables, guidelines for preparing good graphic charts, pictorial games, gantt charts, kiviat graphs, schumacher charts, decision maker's games.
Stochastic processes, markov chains, chapman-kolmogorov equations, classification of states of a markov chain, long-run properties of markov chains, first passage times, absorbing states, continuous - time markov chains.

UNIT - III:

Elements of a queuing model, Analysis of a single queue- Birth-Death Processes, M/M/1 Queue, M/M/m Queue, M/M/m/B Queue; Queuing decision models, Queuing networks- Open and closed Queuing networks, product for networks, Queuing network models of Computer Systems.

Operational laws - Utilization laws, forced flow law, Little's law, general response time law, interactive response time law, Bottleneck analysis.

UNIT - IV:

Simulation models- Continuous, discrete and discrete-continuous; discrete simulation approaches – Event-oriented, process-oriented and activity scanning; General principles, Random number generation, Random-variate generation, Input modeling, Verification and validation of simulation models.
Simulation examples – Queuing systems, evaluation of memory management techniques, CPU scheduling algorithms, disk handling algorithms, computer network protocols, web-server systems and data mining algorithms.

UNIT - V:

Output analysis for single model, comparison and evaluation of alternative system design
Introduction to experimental design- Terminology, common mistakes in experimentation, types of experimental designs; 2^k Factorial designs, $2^k r$ Factorial designs, 2^{k-p} Fractional factorial designs, general full factorial designs with k factors

Text Books:

1. Raj Jain, "The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling", Wiley Professional Computing, 1991.
2. Jerry Banks et al, Discrete- Event System Simulation, 3rd Edition, Pearson Education, 2001
3. Sartaj Sahni, Data Structures Algorithms and Applications in C++, 2nd Edition, Universities Press, 2005

Reference Books:

1. Kishor S. Trivedi, Probability & Statistics with Reliability, Queuing, and Computer Science Applications, Eastern Economy Edition, 1982
2. Hamdy A. Taha, Operations Research: An Introduction, 9th Edition, Prentice Hall, 2011.

Elective - II

SOFTWARE PROJECT MANAGEMENT

I – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To plan and manage projects at each stage of the software development life cycle (SDLC)
- To familiarize successful software projects that support organization's strategic goals

Learning Outcomes:

Students will be able to

- match organizational needs to the most effective software development model
- understand the basic concepts and issues of software project management
- plan effectively the software projects
- implement the project plans through managing people, communications
- select and employ mechanisms for tracking the software projects
- create project plans that address real-world management challenges

UNIT - I:

Conventional Software Management- The waterfall model, conventional software management performance.

Evolution of Software Economics- Software economics, pragmatic software cost estimation.

Improving Software Economics- Reducing software product size, improving software processes, improving team effectiveness, improving automation, achieving required quality, peer inspections.

The old way and the new- The principles of conventional software engineering, principles of modern software management, transitioning to an iterative process.

UNIT - II:

Life cycle phases- Engineering and production stages, inception, elaboration, construction, transition phases.

Artifacts of the process- The artifact sets, management artifacts, engineering artifacts, programmatic artifacts.

Model based software architectures- A management perspective and technical perspective.

Work Flows of the process- Software process workflows, Iteration workflows.

UNIT - III:

Checkpoints of the process- Major mile stones, minor milestones, periodic status assessments.

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

UNIT - IV:

Project organizations and responsibilities- Line-of-Business organizations, project organizations, evolution of organizations.
Process Automation- Automation building blocks, the project environment.

UNIT - V:

Project control and process instrumentation- The seven core metrics, management indicators, quality indicators, life cycle expectations, pragmatic software metrics, metrics automation.

Tailoring the process- Process discriminants.

Future software project management- Modern project profiles, next generation software economics, modern process transitions.

Case study: The command center processing and display system- replacement (CCPDS-R)

Text Books:

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

Reference Books:

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

Elective - II

DIGITAL IMAGE PROCESSING

I – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To gain the knowledge in various image processing techniques.

Learning Outcomes:

Students will be able to

- use appropriate image enhancement technique to improve the quality of an image.
- apply suitable image segmentation technique for an application.
- analyze various image compression techniques.
- apply morphological operations to modify the structure of an image.

UNIT - I:

Introduction- Digital image processing, examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system.

Digital image fundamentals- Image sensing and acquisition, sampling and quantization, basic relationships between pixels.

UNIT - II:

Image enhancement in the spatial domain- introduction, Basic gray-level transformations, histogram processing, enhancement using arithmetic and logic operators. basics of spatial filtering, smoothing and sharpening spatial filters, combining the spatial enhancement methods.

UNIT - III:

Color image processing- Introduction, color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transformations, color image smoothing and sharpening, color segmentation.

UNIT - IV:

Image compression- Fundamentals, image compression models, error-free compression, lossy predictive coding.

UNIT - V:

Morphological image processing- Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms

Image segmentation: Detection of discontinuous, edge linking and boundary detection, thresholding, region–based segmentation.

Text Books:

1. Rafeal C.Gonzalez, Richard E.Woods,"Digital Image Processing", 2nd Edition, Pearson Education/PHI.

Reference Books:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle,"Image Processing, Analysis, and Machine Vision", 2nd Edition, Thomson Learning.
2. Adrian Low,"Computer Vision and Image Processing", 2nd Edition, B.S.Publications
3. William K. Prat,"Digital Image Processing", Wily 3rd Edition
4. B. Chanda, D. Datta Majumder,"Digital Image Processing and Analysis", Prentice Hall of India, 2003

SOFTWARE LAB - I

I – Semester

Practical	: 6	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To impart practical knwoledge about data structures and data bases

Learning Outcomes:

Students will be able to

- develop programs for various types of data structures.
- implement various operations on data bases.

PART - I
Data Structures and Algorithm

1. Perform various operations such as insertion, deletion, display on single linked lists and implement (i) Stacks using linked list (ii) Queues using linked list
2. Perform different types of searching techniques on a given list (i) Sequential search (ii) Binary search
3. Perform different types of sorting on a given list (i) Quick sort (ii) Merge sort (iii) Heap sort
4. Implement dictionaries using hashing technique
5. Perform various operations on Binary search tree.
6. Perform operations on AVL trees.

PART - II
Database Management Systems

1. Consider the following relations for a order processing database application in a company.
   CUSTOMER (**custno**:int , cname:string , city:string)
   ORDER (**orderno**:int , odate:date , custno:int , ord_amt:int)
   ORDER_ITEM (**orderno**:int , **itemno**:int , quantity:int)
   ITEM (**itemno**:int , unitprice:int)
   SHIPMENT (**orderno**:int , **warehouseno**:int , ship_date:date)
   WAREHOUSE (**warehouseno**:int , city:string)
   1) Create the above tables by properly specifying the primary keys and foreign keys.
   2) Enter at least five tuples for each relation.
   3) Produce a listing: custname , No_of_orders , Avg_order_amount , where the middle column is the total number of orders by the customer and the last column is the average order amount for that customer.
   4) List the orderno for orders that were shipped from ***all*** the warehouses that the company has in a specific city.
   5) Demonstrate the deletion of an item from the ITEM table and demonstrate a method of handling the rows in the ORDER_ITEM table that contains this particular item.
2. Consider the following database of student enrollment in courses and books adopted for that course.
   STUDENT (**regno**:string , name:string , major:string , bdate:date)
   COURSE (**courseno**:int , cname:string , dept:string)
   ENROLL (**regno**:string , **courseno**:int , **sem**:int , marks:int)
   BOOK_ADOPTION (**courseno**:int , **sem**:int , book_isbn:int)
   TEXT (**book_isbn**:int , book_title:string , publisher:string , author:string)
   1) Create the above tables by properly specifying the primary keys and foreign keys.
   2) Enter atleast five tuples for each relation.
   3) Demonstrate how you add a new text book to the database and make this book to be adopted by some department.
   4) Produce a list of text books (includes courseno , book_isbn , book_title) in the alphabetical order for courses offered by the 'CS' department that use more than two books.
   5) List any department that has ***all*** its books published by a specific publisher.
3. Create views
4. Write triggers
5. Create indices
6. Implement operations on relations using PL/SQL

WIRELESS NETWORKS

II – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To gain knowledge of the underlying networking technologies, architectures and protocols

Learning Outcomes:

Students will be able to

- understand state-of-the-art wireless technologies.
- apply the routing algorithms in any large scale dynamic networks.
- design a secure Ad Hoc and wireless sensor networks.

UNIT - I:

Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc wireless networks, characteristics of MANETs, applications of MANETs, issues and challenges of MANETs.

Routing in MANETs- Classification of routing protocols, topology- based versus position – based approaches, topology based routing protocols; position based routing, other rotuing protocols.

UNIT - II:

Data Transmission in MANETs – The broadcast strom, multicasting, Geocasting, TCP over Ad Hoc Networks- TCP protocol overview, TCP and MANETs, solutions for TCP over Ad Hoc.

Security in MANETs – Security in Ad Hoc wireless networks, key management, secure routing, cooperation in MANETs, intrusion detection systems.

UNIT - III:

Basics of Wireless Sensors and Applications – The mica mote, sensing and communication range, design issues, energy consumption, clustering of sensors, applications.

Data Retrieval in Sensor Networks – Classification of WSNs, MAC layer, routing layer, high-level application, layer support, adapting to the internet dynamic nature of WSNs.

UNIT - IV:

Sensor Network Platforms and Tools- Sensor Node Hardware, Sensor Network Programming challenges, Node- Level Software Platforms, Node- Level simulators.

UNIT - V:

Security in WSNs – Security in wireless sensor networks, key management in wireless sensor networks, secure data aggregation in wireless sensor networks, introduction to vehicular Ad Hoc networks, introduction to wireless mesh networks.

Text Books:

1. Carlos de Morais Cordeiro and Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications" , World Scientific Publications / Cambridge University Press, 2006.
2. Feng Zhao, Leonidas Guibas,"Wireless Sensor Networks: An Information Processing Approach", Elsevier Science Imprint, Morgan Kauffman Publishers, 2005.

Reference Books:

1. C. Siva Ram Murthy and B.S. Manoj,"Ad Hoc Wireless Networks: Architectures and Protocols" , Pearson Education, 2004.
2. Sudip Misra, Issac Woungang, and Subhas Chandra Misra,"Guide to Wireless Ad Hoc Networks", Springer International Edition, 2011.
3. Sudip Misra, Issac Woungang, and Subhas Chandra Misra,"Guide to Wireless Sensor Networks" , Springer International Edition, 2012.
4. Thomas Krag and Sebastin Buettrich,"Wireless Mesh Networking", O' Reilly Publishers, 2007.

DATA MAINING AND DATA WAREHOUSING

II – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To gain knowledge of relevant data mining technique for mining interesting patterns.
- To familiarize the strengths and weaknesses of various data mining algorithms.

Learning Outcomes:

Students will be able to

- examine the types of data for applying data mining techniques.
- apply preprocessing techniques on raw data to transform it to the desired form for the respective data mining technique.
- understand data warehousing and OLAP technology
- apply suitable data mining technique to discover interesting patterns from large amounts of data
- analyze supervised and unsupervised algorithms with respect to their accuracy

UNIT - I:

Introduction to Data Mining- What is data mining, motivating challenges, origins of data mining, data mining tasks, types of Data attributes and measurements, types of data sets, data quality, data preprocessing

UNIT - II:

Measures of Similarity and Dissimilarity- Similarity and dissimilarity between simple attributes, dissimilarities between data objects, examples of proximity measures, similarity measures for binary Data, jaccard coefficients, cosine similarity, extended Jaccard coefficients, correlation. data ware house: basic concepts: data ware housing modeling: data cube and OLAP.

UNIT - III:

Classification- Basic concepts, general approach to solving a classification problem, decision tree induction: working of decision tree, building a decision

tree, methods for expressing attribute test conditions, measures for selecting the best split, algorithm for decision tree induction.

Model Over fitting- Over fitting due to presence of noise, over fitting due to lack of representation examples, evaluating the performance of classifier: hold out method, random sub sampling, cross validation, bootstrap alternative techniques: Bayesian classifiers, Bayes theorem, using the Bayes theorem for classification, Na¨ive Bayes classifier, Base error rates, Bayesian belief network

UNIT - IV:

Association Analysis- Problem definition, frequent item-set generation- the apriori principle, frequent item set generation in the apriori algorithm, candidate generation and pruning, support counting. rule generation, compact representation of frequent item sets, FP-growth algorithm

UNIT - V:

Overview- Types of clustering, basic K-means, K-means-additional issues, strengths and weaknesses, agglomerative hierarchical clustering, specific techniques, DBSCAN, traditional density, center-based approach, strengths and weaknesses .

Text Books:

1. Pang-Ning tan, Michael Steinbach, Vipin Kumar,"Introduction to Data Mining", Pearson
2. Jiawei Han and Micheline Kamber, "Data Mining:Concepts and Techniques", 3rd Edition Elsevier

Reference Books:

1. GK Gupta ,"Introduction to data mining with case studies", 2nd edition, PHI
2. Dunham,Sridhar,"Data Mining: introduction and advanced Topics",Pearson.
3. Alex Berson, Stephen Smith ,"Data warehousing, data mining &OLAP", TMH

CRYPTOGRAPHY AND NETWORK SECURITY

II – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To familiarize basic concepts, principles, and mechanisms in information security.
- To familiarize threats and security goals in networking environment.

Learning Outcomes:

Students will be able to

- understand different network technologies and their security weaknesses.
- design a strong encryption and centralized authentication mechanisms in wireless networks for an organization.
- understand the major techniques that a hacker can use against networks.
- use various hacking and vulnerability assessment tools to assess the security of the network.
- identify and fix vulnerabilities and mis-configurations in major network technologies.

UNIT - I:

Security Attacks- interruption, interception, modification and fabrication; **Security Services-** confidentiality, authentication, integrity, non-repudiation, access control and availability; and mechanisms, a model for internetwork security, internet standards and RFCs.

Non Cryptographic protocol vulnerabilities- DOS, DDoS, session hijacking and spoofing

Software vulnerabilities- Phising, buffer overflow, format string attacks, SQL injection, basics of cryptography, substitution techniques and transposition techniques

UNIT - II:

Conventional encryption principles, conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution approaches of message authentication, secure hash functions and HMAC.

UNIT - III:

Public key cryptography principles, public key cryptography algorithms, digital signatures, Digital Certificates, Certificate Authority and key management Kerberos, X.509 directory, authentication service.

UNIT - IV:

Email privacy- Pretty Good Privacy (PGP) and S/MIME.

IP Security Overview, IP security architecture, authentication header, encapsulating, security payload, combining security associations and key management

UNIT - V:

Web security requirements, secure socket layer (SSL) and transport layer security(TLS), secure electronic transaction (SET).

Basic concepts of SNMP, SNMPv1 community facility and SNMPv3. intruders, viruses and related threats.

Firewall design principles, trusted systems, intrusion detection systems.

Text Books:

1. Stallings, "Cryptography and network Security, Principles and practice", 5th edition, PHI/Pearson
2. William Stallings,"Network Security Essentials (Applications and Standards)" , Pearson Education.

Reference Books:

1. Ryan Russel, Dan Kaminsky et al,"Hack Proofing your network ", Wiley Dreamtech.
2. Eric Maiwald ,"Fundamentals of Network Security " ,Dreamtech press
3. Michael Whitman,Herbert Mattord,"Principles of Information Security", Cengage Learning.
4. Buchmann, "Introduction to Cryptography", Springer.

OBJECT ORIENTED SOFTWARE ENGINEERING

II – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To gain knowledge of real time software development process.

Learning Outcomes:

Students will be able to

- understand basic concepts of software engineering and software problems.
- choose appropriate software development life cycle model for developing software product.
- prepare a document for different artifacts of the software engineering process.
- design and implement a software product.
- design different test cases for testing a software product.

UNIT - I:

Historical, economic and maintenance aspects. introduction to oo paradigm. different phases in structured paradigm and oo paradigm. software process and different life cycle models and corresponding strengths and weaknesses.

UNIT - II:

Estimation of duration and cost , COCOMO components of software. project management plan , one case study.
Cost - Benefit analysis, introduction to software metrics and CASE tools. taxonomy and scope of CASE tools.
Introduction to testing, with focus on utility, reliability, robustness, performance, correctness.

UNIT - III:

Cohesion and coupling, data encapsulation and information hiding aspects of objects. inheritance, polymorphism and dynamic binding aspects. cohesion and coupling of objects. reusability, portability and interoperability aspects.

UNIT - IV:

Rapid prototyping method, specification phase , specification document, formal methods of developing specification document, examples of other semi - formal methods of using finite-state- machines, petri nets and e- language.

UNIT - V:

Use case modeling, class modeling , dynamic modeling, testing during OO analysis
Data oriented design, object oriented design, formal techniques for detailed design. one case study. challenges in design phase.
Implementation , Integration and maintenance phases, OOSE aspects in these phases

Text Books:

1. Stephen R. Schach,"Object oriented and Classical Software Engineering", 7/e, TMH
2. Timothy Lethbridge, Robert Laganiere,"Object oriented and classical software Engineering", TMH

Reference Books:

1. Ivica Crnkovic, "Component-based software engineering", 7th international symposium, CBSE 2004, Springer

Elective - III

HUMAN COMPUTER INTERFACE

II – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To familiarize the fundamental principles for the design of user friendly GUI.

Learning Outcomes:

Students will be able to

- evaluate user interface designs by performing usability studies (observations) with human subjects
- choose an appropriate interaction style for a given task.
- choose appropriate widgets and windows for a GUI.
- implement simple widget based GUIs both for desktop applications and for the Web.

UNIT - I:

Introduction- Importance of user interface – definition, importance of good design, benefits of good design, a brief history of screen design.
The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, characteristics, web user – interface popularity, characteristics- principles of user interface.

UNIT - II:

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

UNIT - III:

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

UNIT - IV:

Windows- New and navigation schemes selection of window, selection of devices based and screen based controls. components – text and messages, icons and increases – multimedia, colors, uses problems, choosing colors.

UNIT - V:

Software Tools- Specification methods, interface – building tools. interaction devices – keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

Text Books:

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

Reference Books:

1. Alan Dix, Janet Fincay, Gre Goryd, Abowd,Russell Bealg, "Human – Computer Interaction", Pearson.
2. Yvonne Rogers, Helen Sharp, Jenny Preece,"Interaction Design Prece", Wiley Dreamtech,
3. Soren Lauesen ,"User Interface Design", Pearson Education.

Elective - III

ARTIFICIAL INTELLIGENCE

II – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To gain knowledge of Searching methods used in Artificial Intelligence and their applications
- To familiarize different approaches to represent the Knowledge.

Learning Outcomes:

Students will be able to

- use Searching methods to solve AI problems.
- use propositional and predicate logics in solving Inference problems.
- compare performance of different approaches to represent knowledge.
- analyze expert systems and their applications.

UNIT - I:

Introduction to artificial intelligence- Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

UNIT - II:

Problem Solving- State-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction, means ends analysis.

Problem reduction and game playing- Introduction, problem reduction, game playing, alpha-beta pruning, two-player perfect information games.

UNIT - III:

Logic Concepts- Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic and predicate logic.

UNIT - IV:

Knowledge representation- Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques- Introduction, conceptual dependency theory script structure, semantic web.

UNIT - V:

Expert system and applications- Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems, blackboard systems, truth maintenance systems, application of expert systems, list of shells and tools**.**

Uncertainty measure- probability theory: introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory.

Text Books:

1. Elaine Rich & Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw Hill Edition
2. Stuart J. Russell,"Artificial Intelligence: A Modern Approach", 2nd Edition, Pearson Education,

Reference Books:

1. Patrick Henry Winston, "Artificial Intelligence", Pearson Education, .
2. Russel and Norvig, "Artificial Intelligence", Pearson Education/ PHI

Elective - III

BIG DATA

II – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To familiarize the fundamental concepts of cloud for laying a strong foundation of Apache Hadoop (Big data framework).
- To gain knowledge of HDFS file system, Map Reduce frameworks and relevant tools.

Learning Outcomes:

Students will be able to

- understand the fundamentals of Big cloud and data architectures.
- use HDFS file structure and Map reduce frameworks to solve complex problems.
- use relational data in a Hadoop environment, using Hive and H base tools.

UNIT - I:

Introduction to Big Data. what is Big Data. why Big Data is important. meet hadoop. data. data storage and analysis. comparison with other systems. Grid computing, brief history of Hadoop. apache Hadoop and the Hadoop eco system. linux refresher; VM Ware installation of Hadoop.

UNIT - II:

The design of HDFS, HDFS concepts, command line interface to HDFS, Hadoop file systems, interfaces, java interface to Hadoop, anatomy of a file read, anatomy of a file write, replica placement and coherency model, parallel copying with distcp, keeping an HDFS cluster balanced.
Introduction, analyzing data with unix tools, analyzing data with hadoop, java map reduce classes (new API), data flow, combiner functions, running a distributed map reduce job, configuration API.

UNIT - III:

Setting up the development environment, managing configuration, writing a unit test with MRUnit, running a job in local job runner, running on a cluster, launching a job, the Map Reduce WebUI.

UNIT - IV:

Classic map reduce, job submission, job initialization, task assignment, task execution, progress and status updates, job completion, shuffle and sort on map and reducer side, configuration tuning, map reduce types, input formats, output formats ,sorting. map side and reduce side joins.

UNIT - V:

The Hive Shell, Hive services, Hive clients, the meta store, comparison with traditional databases, Hive Ql, H basics, concepts, implementation, java and map reduce clients, loading data, web queries.

Text Books:

1. Tom White, "Hadoop - The Definitive Guide", 3rd Edition, O'Reilly Publications, 2012.
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch ,"Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", 1st Edition, TMH,2012.

Reference Books:

1. Frank J.Ohlhorst, "Big Data Analytics: Turning Big Data Into Big Money",2nd edition, TMH,2012.

Elective - IV

CLOUD COMPUTING

II – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To gain knowledge Virtualization, Virtual Machine and different models of VM.
- To familiarize Cloud computing architecture and its security aspects.

Learning Outcomes

Students will be able to

- distinguish Virtualization and Virtual Machine, physical and virtual networks.
- understand Cloud Scale and value of Cloud Computing.
- understand disaster recovery and disaster management.
- design a Cloud for an Enterprise.

UNIT - I:

Introduction to virtualization and virtual machine, virtualization in cluster / grid context virtual network, information model & data model for virtual machine, Software as a Service (SaaS), SOA, On Demand Computing (ODC).

UNIT - II:

Cloud computing- Introduction, what it is and what it isn't, from collaborations to cloud, cloud application architectures, value of cloud computing, cloud infrastructure models, scaling a cloud infrastructure, capacity planning, cloud scale.

UNIT - III:

Data Center to Cloud- move into the cloud, know your software licenses, the shift to a cloud cost model, service levels for cloud applications.

UNIT - IV:

Security- Disaster recovery, web application design, machine image design, privacy design, database management, data security, network security, host security, compromise response.

UNIT - V:

Defining Clouds for the Enterprise- Storage-as-a-Service, Database-as-a- Service, Information-as-a-Service, Process-as-a-Service, Application-as-a- Service, Platform-as-a-Service, Integration-as-a-Service, Security-as-a-Service, Management/Governance-as-a-Service, Testing-as-a-Service Infrastructure-as-a-Service.

Text Books:

1. Michael Miller, "Cloud Computing – Web Based Applications That change the way you work and Collaborate Online", Person Education.
2. George Reese,"Cloud Application Architectures", 1st edition, O'Reilly Media.

Reference Books:

1. David S. Linthicum, "Cloud Computing and SOA Convergence in your Enterprise : A Step-by-Step Guide", Addison-Wesley Professional.
2. Kai Hwang, Geoffery C.Fox,Jack J, Dongarra," Distributed & Cloud Computing From Parallel Processing to the Internet of Things"

Elective - IV

BIO - INFORMATICS

II – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To gain knowledge of basic structure of human genome and make computations based on its structure.

Learning Outcomes:

Students will be able to

- understand developments in Biomedical Technologies, scope, uses and applications of Bioinformatics.
- understand how deoxynucleoxides can be used to obtain DNA sequence information
- use Sequencing Alignment and Dynamic Programming Algorithms for solving related problems.
- analyze different Bio-Chemical Databases

UNIT - I:

Introduction to Bioinformatics-Scope of Bio-informatics, elementary commands and protocols, ftp, telnet, http. Primer on information theory.
Introduction to Homology- Introduction to Homology (with special mention to Charles Darwin, Sir Richard Owen, Willie Henning, Alfred Russel Wallace).

UNIT - II:

Special Topics In Bioinformatics-DNA mapping and sequencing, Map alignment, large scale sequencing methods Shotgun and Sanger method.

UNIT - III:

Sequencing Alignment and Dynamic Programming-Heuristic alignments, algorithms. Global sequence alignments-Needleman-Wunsch algorithm ,Smith-Waterman algorithm,Local sequence alignments Amino acid substitution Matrices (PAM, BLOSUM).

UNIT - IV:

Primary Database and their Use-Introduction to Biological databases, organization and management of databases. searching and retrieval of information from the World Wide Web, Structure databases-PDB (Protein Data Bank), Molecular Modeling Databases (MMDB). Primary Databases NCBL, EMBL, DDBJ.
Secondary Databases- Introduction to secondary databases organization and management of databases swiss rot, PIR, KEGG

UNIT - V:

Bio Chemical Data Bases-Introduction to Bio-Chemical databases,organization and management of databases, KEGG, EXGESCY, BRENDA, WIT.

Text Books:

1. Hooman H. Rashidi and Lukas K.Buehler,"Bioinformatics Basics. Applications in Biological Science and Medicine ", CAC Press 2000.
2. Dan Gusfiled,"Algorithms on Strings Trees and Sequences", Cambridge University Press 1997.

Reference Books:

1. P. Baldi. S. Brunak, "Bioinformatics: A Machine Learning Approach" MIT Press 1988.
2. David Mount,"Bioinformatics",CSH Publications, 2000
3. Cynthia Gibbas & Per Jamberk,"Developing Bioinformatics Skills"
4. Sandor Suhai,"Genomics and Proteomics-Functional and Computational aspects", Springer Publications.

Elective - IV

PARALLEL COMPUTING

II – Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To familiarize with the architecture of Parallel Computing.
- To gain knowledge of various algorithms suitable for Parallel Computing.

Learning Outcomes:

Students will be able to

- understand the classification of various classes of sequential algorithms.
- analyze various algorithms used in parallel processors and Array Processors.
- compare the performance of various algorithms used in SIMD and MIMD machines

UNIT - I:

Introduction-Computational demand in various application areas, advent of parallel processing, terminology-pipelining, data parallelism and control parallelism-Amdahl's law, basic parallel random access Machine Algorithms-definitions of P, NP and NP-Hard, NP-complete classes of sequential algorithms, NC-class for parallel algorithms.

UNIT - II:

Scheduling-Organizational features of processor Arrays, multi processor and multi-computers, mapping and scheduling aspects of algorithms, Coffman-graham scheduling algorithm for parallel processors

UNIT - III:

Algorithms-1- Elementary parallel algorithms on SIMD and MIMD machines, analysis of these algorithms. matrix multiplication algorithms on SIMD and MIMD models.

Algorithms-2- Fast Fourier Transform algorithms. implementation on Hyper cube architectures, solving linear file-system of equations, parallelizing aspects of sequential methods back substitution and Tri diagonal.

UNIT - IV: Array Processors

Array processors- 2D-Mesh processor and Hypercube processor array. Sorting- Parallel sorting methods, Odd-even transposition sorting on processor arrays, parallel Quick-sort on Multi processors. Hyper Quick sort on hypercube multi computers, merge sort on shuffle-exchange ID.

UNIT - V:

Searching-Parallel search operations. Ellis algorithm, Manber and lander's Algorithms for dictionary operations. parallel algorithms for Graph searching, all Pairs shortest paths and minimum cost spanning tree.

Text Books:

1. Michel J. Quinn,"Parallel computing theory and practice".
2. Guy E. Blelloch,"Programming Parallel Algorithms", Communications of the ACM

SOFTWARE LAB - II

II – Semester

Practical	: 6	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

- To familiarize the implementation of various security algorithms.
- To gain knowledge of designing various software products.

Learning Outcomes:

Students will be able to

- implement various security algorithms both in wired and wireless networks.
- design various real time software products.

PART - I
Network Security & Wireless Networks

1. Implement different substitution and transposition techniques
2. Implement DES encryption & decryption algorithm.
3. Implement Diffie - Hellman key exchange algorithm
4. a) Implement RSA algorithm to generate key
   b) Using RSA algorithm encrypt a text data
   c) Using RSA algorithm decrypt a text data
5. Implement Hash Algorithms
6. Implement any virus application
7. Socket Programming
   a. TCP Sockets
   b. UDP Sockets
   c. Applications using Sockets
8. Simulation of Routing Protocols
9. Wireless network programs
   a. To create Menu
   b. To check the format of the given phone number
10. Write an android application program that converts the temperature in Celsius to Fahrenheit.

PART - II
Object Oriented Software Engineering

1. Create UML diagrams for Banking System
2. Create UML diagrams for On-line Bookshop system