Department of Computer Science & Engineering

Birla Institute of Technology, Mesra, Ranchi - 835215
(India)

B.TECH IN INFORMATION TECHNOLOGY

(Semester III)

COURSE INFORMATION SHEET
Course code: MA205
Course title: Discrete Mathematics
Pre-requisite(s):
Co- requisite(s):
Credits: L: 3 T:1 P:0 C: 4
Class schedule per week: 3 Lectures, 1 tutorial
Class: I. M.Sc. /B. Tech
Semester / Level: 2
Branch: B. Tech
Name of Teacher:

Course Objectives: This course enables the students to

1.	exposed to a wide variety of mathematical concepts that are used in the Computer Science discipline, which may include concepts drawn from the areas of Number Theory, Graph Theory and Combinatorics.
2.	come across a number of theorems and proofs. Theorems will be stated and proved formally using various techniques.
3.	gain the various graphs algorithms along with its analysis
4.	apply graph theory based tools in solving practical problems.

Course Outcomes: After the completion of this course, students will be able to

CO 1.	to model and analyze computational processes using analytic and combinatorial methods
CO 2.	solve the problems of graph theory using graph algorithms
CO 3.	apply computer programs (e.g. SAGE) to study graphs.

CO 4.	apply counting techniques to solve combinatorial problems and identify, formulate, and solve computational problems in various fields.
CO 5.	apply graph theory in the areas of computer science, operation research, biology, chemistry, physics, sociology, and engineering

SYLLABUS

Module I

Mathematical logic and Mathematical Reasoning, Compound Statements, Propositional Equivalences, Predicates and Quantifiers, Methods of Proof, Mathematical Induction, Well- ordering principal, Recursive Definition and Algorithms. [9L]

Module II

Recurrence Relations, Classification of Recurrence Relations and their solutions by Characteristic Root method, Generating function and their various aspects, Utility of Generating function in solving Recurrence Relations.

[9L]

Module III

Set, Operations on Set, Computer representation of Set, Relations, Properties/Classification of Relations, Closure operations on Relations, Matrix representation of Relations, Digraphs.

Functions and their Representation, Classification of Functions, Warshall's algorithm, Discrete Numeric Functions, Growth of Functions, Big O, Big Q, Hash Function, Growth Functions.

[9L]

Module IV

Binary Operations, Groups, Product and Quotients of Groups, Semi group, Products and Quotients of Semi groups, Permutation Group, Composition of Permutation, Inverse Permutation, Cyclic Permutation, Transposition, Even and Odd Permutation, Coding of Binary Information and Error Correction, Decoding and Error Correction.

[9L]

Module V

Introduction to Graph, Graph Terminologies and their Representation, Connected & Disconnected graphs, Isomorphic Graph, Euler & Hamilton graphs. Introduction to Trees, Versatility of Trees, Tree traversal. Spanning Trees, Minimum Spanning Tree.

[9L]

Text Books:

1. **Mott, Joe L., Abraham Kandel, and Theodore P. Baker** Discrete Mathematics for ComputerScientists& Mathematicians, PHI, 2nd edition 2002.
2. **Swapan Kumar Chakraborty and BikashKanti Sarkar**: Discrete Mathematics, Oxford Univ.Publication, 2010.
3. **Kolman, Bernard, Robert C. Busby, and Sharon Ross.** Discrete mathematical structures,Prentice-Hall, Inc., 2003**.**

Reference Books:

1. **BikashKanti Sarkar and Swapan Kumar Chakraborty,** *Combinatorics and Graph Theory*, PHI,2016.
2. **Seymour Lipschuz and Mark Lipson**,*Discrete Mathematics*, Shaum's outlines, 2003.
3. **Liu, Chung Laung,** *Elements of Discretemathematis*, Mcgraw Hill, 2ndedition, 2001.
4. Bondy and Murty, Grapg Theory with Applications, American Elsevier,1979.
5. Robin J. Wilson, Introduction to Graph Theory, Pearson, 2010.

Course Delivery Methods
Lecture by use of boards/lcd projectors/ohp projectors
Tutorials/assignments
Seminars
Mini projects/projects
Laboratory experiments/teaching aids
Industrial/guest lectures
Industrial visits/in-plant training
Self- learning such as use of nptel materials and internets
Simulation

Course outcome (co) attainment assessment tools & evaluation procedure

Direct assessment

Assessment tool	**% contribution during co assessment**
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment components	CO1	CO2	CO3	CO4	CO5
Mid semester examination	√	√	√		
End semester examination	√	√	√	√	√
Quiz (s)	√	√	√		
Assignment	√	√	√	√	

Indirect assessment –

1. Student feedback on course outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO1	3	2	2	1	2	1	1	1	1	1	1	2	3	3
CO2	2	3	3	1	1	2	1	1	1	1	1	2	2	2
CO3	2	3	3	3	2	1	1	2	1	2	1	1	2	2
CO4	3	3	2	1	1	1	1	1	2	2	1	2	3	2
CO5	3	2	2	1	3	1	2	2	1	2	2	2	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7

CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: EC203
Course title: Digital System Design
Pre-requisite(s): .
Co- requisite(s):
Credits: L: 3 T:0 P:0 C:3
Class schedule per week: 3x1
Class: B. Tech
Semester / Level: III/02
Branch: ECE
Name of Teacher:

Course Objectives This course enables the students to:

A.	Understand the basics of the digital electronics.
B.	Apply the knowledge of digital electronics to construct various digital circuits.
C.	Analyse the characteristics and explain the outputs of digital circuits.
D.	Evaluate and asses the application of the digital circuits.
E.	Design digital machine for simple computing and control.

Course Outcomes After the completion of this course, students will be able to:

CO1	Explain the concept of digital electronics.
CO2	Apply the knowledge to produce digital electronics circuits.
CO3	Analyse and categorize digital circuits.
CO4	Justify the uses of different digital circuits.
CO5	Schematize and demonstrate simple computing machines.

SYLLABUS

Module – 1:

Basics of Digital Electronics: Number representation, Binary number system, Number base conversion, Octal, Hexadecimal and BCD codes, binary Arithmetic, Logic gates, Introduction to VHDL and Verilog, VHDL Models, Logic Families: TTL, ECL, and CMOS Logic Circuits, Logic levels, voltages and currents, fan-in, fan-out, speed, power dissipation. Comparison of logic families.

Module – 2:

Simplification of Boolean functions: Boolean Algebra, Basic theorems and Properties, De Morgan's theorem, Canonical & Standard forms, Simplification of Boolean function using Karnaugh map, POS& SOP simplification, Prime implicant, NAND and NOR implementation,.

Module – 3:

Design of Combinational Circuits: Analysis and design procedure, Parity Generators and Checkers, Adders, Subtractors, Look ahead carry, Adder, 4-bit BCD adder/subtractor, Magnitude comparator, Decoders, Encoders, Multiplexers, De-multiplexers, , Design of 1 bit ALU for basic logic and arithmetic operations.

Module – 4:

Design of Sequential Circuits and Memories: Basic Latch, Flip-Flops (SR, D, JK, T and Master-Slave), Triggering of Flip Flops, Synchronous and asynchronous counters, Registers, Shift Registers, Memories and Programmable Logic design, Types of memories, Memory Expansion and its decoding, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL)

Module – 5:

Design of simple computing machines: SAP-I concepts with stress on timing diagrams, Microinstructions, Fetch and Execution cycle variable machine cycle, Hardware control Matrix, Macroinstructions, Microprogramming , Bus concepts, Multiplexed Minimum system. Pipelining concepts.

Textbooks:

1. "Digital Design", Morris Mano and Michael D. Ciletti ,5th edition PHI
2. "Digital System Design using VHDL", Charles H Roth, Thomson Learning

Reference books:

1. Digital computer Electronics AP Malvino, 3rd Edition Mc Graw Hill

Gaps in the syllabus (to meet Industry/Profession requirements): Hands-on-practical on microprocessor trainer Kit

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Cours**Course Delivery Methods**

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

COURSE INFORMATION SHEET

Course code: CS231
Course title: Data Structures

Pre-requisite(s):
Co- requisite(s):
Credits: L: 3 T: 1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: II/2
Branch: CSE/IT

Course Objectives This course enables the students:

A.	To be familiar with basic techniques of algorithm analysis.
B.	To understand basic concepts about arrays, stacks, queues, linked lists, trees and graphs.
C.	To understand concepts of searching and sorting techniques.
D.	To implement various linear & non-linear data structures; and searching & sorting algorithms.
E.	To assess how the choice of data structures impacts the performance of a program**.**

Course OutcomesAfter the completion of this course, students will be able to:

1.	Define various linear and non-linear data structures like stack, queue, linked list, tree and graph.
2.	Explain operations like insertion, deletion, traversal, searching, sorting etc. on various data structures.
3.	Design various data structures and their operations.
4.	Analyze the performance of data structure based operations including searching and sorting.
5.	Justify the choice of appropriate data structure as applied to specified problem definition.

SYLLABUS

Module I

Basic Concepts

Definition and basics of: Data Structure, ADT, Algorithms, Time and Space Complexity, Asymptotic Notations (O, θ, Ω), Time complexity computation of non-recursive algorithms (like Matrix addition, Selection sort – using step count), Array – basic operations, concept of multi-dimensional array, Polynomial operations using Array, Sparse Matrix.

(8L)

Module II

Stack and Queue

Stack ADT: basic operations, Queue ADT: basic operations, Circular Queue, Evaluation of Expressions, Another application or Mazing Problem.

(8L)

ModuleIII

Linked List

Singly Linked List: concept, representation and operations, Circular Linked List, Polynomial and Sparse Matrix operations using LL, Doubly Linked List: basic concept.

(8L)

Module IV

Tree and Graph

Basic concepts and terminologies, Binary Search Tree and Heap, Disjoint Set, Graph: concept

and terminologies, Concept of BFS, DFS, Spanning Tree, Connected Components. (8L)

Module V

Searching and Sorting

Sequential Search and Binary Search, Insertion Sort, Heap Sort, Radix Sort,External Sorting: k-way merging approach.

(8L)

Text book:

1. SahniHorwitz,, Freed Anderson, Fundamentals of Data Structures in C, 2nd Edition (or latest) , University Press.(T1)

Reference books:

1. TharejaReema, Data Structures Using C, 2nd Edition, Oxford University Press.(R1)
2. Tanenbaum, Langsam, Augenstein, Data Structures using C, Pearson. (R2)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools &

Evaluation procedure Direct Assessment

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty

2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
CO1	2	1	1	1	1	1	1	1	1	1	1	1	2	1
CO2	2	2	1	1	1	1	1	1	1	1	1	1	1	1
CO3	3	3	3	1	2	1	1	1	1	1	1	2	2	2
CO4	3	3	2	1	2	1	1	1	1	1	1	2	2	3
CO5	2	2	3	2	2	1	1	2	1	1	1	2	3	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS233
Course title: Object Oriented Programming and Design Pattern
Pre-requisite(s): Data Structure
Co- requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: II/2
Branch: CSE/IT

Course Objectives This course enables the students:

1.	The course shall allow students to understand the basic tenets of OOP.
2.	The course will exemplify the basic syntax and constructs of JAVA.
3.	The course will help students understand the application OOP principles in various use cases.
4.	The course will explain basic JAVA GUI components and their working.
5.	The course aims to expose students to newer JAVA constructs like NIO, Lambdas etc.

Course Outcomes After the completion of this course, students will be:

1.	Identify the difference between procedural and OO programming.
2.	Construct programs using various OOP principles.
3.	Design UI using JAVA GUI components.
4.	Operate on files and strings in real life scenarios.
5.	Analyze thread performance and inter thread communication issues

SYLLABUS

Module I

Introduction to Classes, Objects and Java

Introduction to Object Technology, Java, Understanding the Java development environment, Programming in Java, Memory concepts, Doing basic Arithmetic, Comparing entities, Classes, Objects, Methods, Strings, Primitive vs reference types.

(8L)

Module II

Control Statements, Methods and Arrays

Basic selection statements, Iterative constructs, Relative and Logical operators, break, continue, Methods, static methods, parameter passing, argument promotion and casting, scopes, method overloading. Arrays and ArrayList in Java, Enhanced for statement, Passing arrays to methods, Multidimensional arrays, Using command line arguments.

(8L)

Module III

Object Oriented Concepts: Polymorphism & Inheritance

Controlling access to class members, the use of this keyword, getters and setters, Composition, enum, the use of static and final, Garbage collection. Superclass and subclass, protected members, constructors in subclass, the Object class, Introduction to polymorphism, Abstract classes and methods, Assignment between subclass and superclass variables, Creating and using interfaces.

(8L)

Module IV

Exception Handling & GUI Design

When to use exception handling, Java exception hierarchy, finally block, Stack unwinding, Chained exceptions, Declaring new exception types, Assertions, try with resources. Simple I/O with GUI, Basic GUI Components, GUI Event handling, Adapter classes, Layout managers, Using panels.

(8L)

Module V

Strings, characters & Files

Working with the String and StringBuilder class, Character class, Tokenizing strings, Regular Expressions, Files and Streams, Using NIO classes, Sequential file handling, Object serialization, JFileChooser, Introduction to threading, Introduction to Generics and lambda expressions.

(8L)

Text book:
Deitel P., Deitel H., Java How to Program, 10^{th} Edition, Pearson Publications, 2016.(T1)

Reference book:
Wu C. T., Object Oriented Programming in Java, 5^{th} Edition, McGrawHill Publications, 2010.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools &

Evaluation procedure Direct Assessment

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
CO1	2	1	2	2	3	3	2	1	1	1	1	2	3	2
CO2	2	1	2	2	3	3	2	1	1	1	1	2	3	2
CO3	2	1	3	3	3	3	2	1	1	1	1	2	3	2
CO4	2	1	3	3	3	3	2	1	1	1	2	3	3	2
CO5	2	1	3	3	3	3	2	1	1	1	2	3	3	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS235

Course title: Computer Organization And Architecture
Pre-requisite(s):
Co- requisite(s):
Credits: L: 3 T: 1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: II
Branch: CSE/IT

Course Objectives This course enables the students:

1.	To understand the basic architecture and organization of systems along with their performances.
2.	To Familiar with Digital Logic circuits, Data representation and Instruction Set Architecture.
3.	To build a complete data path for various instructions.
4.	To understand the pipeline concepts and Hazards.
5.	To familiar with Memory and I/O Organization.

Course Outcomes After the completion of this course, students will be to:

1.	Explain the merits and pitfalls in computer performance measurements and analyze the impact of instruction set architecture on cost-performance of computer design
2.	Explain Digital Logic Circuits ,Data Representation, Register and Processor level Design and Instruction Set architecture
3.	Solve problems related to computer arithmetic and Determine which hardware blocks and control lines are used for specific instructions
4.	Design a pipeline for consistent execution of instructions with minimum hazards
5.	Explain memory organization, I/O organization and its impact on computer cost /performance.

Syllabus

Module I

Basic Structures of Computers

Introduction to Digital Logic, Basic Structure of Computers: Computer Types, Functional Units, Input Unit, Memory Unit, Arithmetic and Logic Unit, Output Unit, Control Unit, Basic Operational Concepts: Fixed and floating point Representation and Arithmetic Operations, Performance, Historical Perspective. (5L)

Module II

Instruction Set Architecture

Memory Locations and Addresses: Byte Addressability, Big-Endian and Little-Endian Assignments, Word Alignment, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Subroutines, Additional Instructions, Dealing with 32-Bit Immediate Values. (5L)

Module III

Basic Processing Unit & Pipelining

Basic Processing Unit: Some Fundamental Concepts, Instruction Execution, Hardware Components, Instruction Fetch and Execution Steps, Control Signals, Hardwired Control, CISC- Style Processors.

Pipelining: Basic Concept, Pipeline Organization, Pipelining Issues, Data Dependencies, Memory Delays, Branch Delays, Pipeline Performance Evaluation.

(10L)

Module IV

Memory Organization

Basic Concepts, Semiconductor RAM Memories, Read-only Memories, Direct Memory Access, Memory Hierarchy, Cache Memories, Performance Considerations, Virtual Memory, Memory Management Requirements, Secondary Storage. (10L)

Module V

Input Output & Parallel Processing Basic Input Output

Accessing I/O Devices, Interrupts

Input Output Organization

Bus Structure, Bus Operation, Arbitration, Interface, Interconnection Standards.

Parallel Processing

Hardware Multithreading, Vector (SIMD) Processing, Shared-Memory Multiprocessors, Cache Coherence, Message-Passing Multicomputers, Parallel Programming for Multiprocessors, Performance Modeling. (10L)

Text Book:

Patterson David A., Hennessy John L., Computer Organization and Design: The Hardware / Software Interface, 5th Edition, Elsevier.(T1)

Reference Books:

Hamachar Carl et. al , Computer Organization and Embedded Systems, 6th Edition, McGraw Hill. (R1)

Mano M. Morris, Computer System Architecture, Revised 3rd Edition, Pearson.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5

Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	
CO1	3	1	1	1	2	1	2	1	2	1	2	2	3	3	
CO2	3	1	1	1	2	1	2	1	2	1	2	2	3	3	
CO3	3	2	2	2	3	1	2	1	2	1	2	2	3	3	
CO4	3	2	2	2	3	1	2	1	2	2	3	3	3	3	3
CO5	3	2	3	3	3	1	2	1	3	1	3	3	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: EC204
Course title: Digital System design Lab
Pre-requisite(s):
Co- requisite(s):
Credits: L:0 T:0 P:3 C:1.5
Class schedule per week: 03
Class: B. Tech
Semester / Level: III/ 02
Branch: ECE
Name of Teacher:

Course Objectives This course enables the students to:

1.	Understand the basics of logic gates, input, output, power supply and gates IC's.
2.	Apply the knowledge of digital electronics to construct combinational and sequential circuits.
3.	Analyse controlled digital circuits with different Boolean function.
4.	Evaluate combinational/sequential circuits and memories.
5.	Translate real world problems into digital logic formulations using VHDL.

Course Outcomes After the completion of this course, students will be able to:

CO1	Describe the knowledge of basic logic gates and their design using universal gates.
CO2	Demonstrate the working of combinational and sequential circuits.
CO3	Integrate and experiment with controlled digital circuits.
CO4	Appraise combinational/sequential circuits and memories.
CO5	Schematize, simulate and implement combinational and sequential circuits to solve real world problems using VHDL systems.

SYLLABUS

List of experiments:

1. Design and implement a controlled CMOS Inverter.
2. To study and verify the truth table of NAND and EX-OR gate using IC 7400.
3. Design and implement SEVEN segment display unit.
4. Design and verify half adder and full Adder circuits using gates and IC 7483.
5. Design and implement a 3:8 Decoder.
6. Design and implement 8:3 priority encoder.
7. Design a 4 bit magnitude comparator using combinational circuits.
8. Design and implement 8:1 multiplexer and 1:4 demultiplexer.
9. Design ALU with functions of ADD, SUB, INVERT, OR, AND.
   XOR, INC, DEC and CMP.
10. Design and verify decade Counter.
11. Design a ROM (8X4) using decoder, gates and diodes.
12. Design of pre settable up/down counter.

Implement all the above experiments using VHDL platform and verify.

Books recommended:

Textbooks:

1. "Digital Design", Morris Mano and Michael D. Ciletti ,5th edition PHI
2. "Digital System Design using VHDL", Charles H Roth, Thomson Learning

Reference books:

1. Digital computer Electronics AP Malvino, 3rd Edition Mc Graw Hill

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u>

<u>POs met through Gaps in the Syllabus:</u>

<u>Topics beyond syllabus/Advanced topics/Design:</u>

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**

Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Course Outcomes and Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	
CO1	2	2	2	1	1	1	2	2	1	2	1	1	1	1	
CO2	3	3	3	1	2	2	2	2	1	2	1	1	2	1	1
CO3	3	3	3	2	2	2	2	2	1	2	1	1	3	2	1
CO4	3	3	3	2	2	2	2	2	2	2	1	1	3	2	1
CO5	3	3	3	3	3	2	3	3	3	3	2	2	3	3	2

< 34% = 1, 34-66% = 2, > 66% = 3

Mapping between Course Outcomes and Course Delivery Method

Course Outcomes	Course Delivery Method
CO1	CD1, CD3, CD6, CD7
CO2	CD1, CD3, CD6, CD7
CO3	CD1, CD3, CD6, CD7
CO4	CD1, CD3, CD6, CD7
CO5	CD1, CD3, CD6, CD7

COURSE INFORMATION SHEET

Course code: CS232
Course title: Data Structures Lab
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: II
Branch: All

Course Objectives This course enables the students:

A.	To assess how the choice of data structures and algorithm design methods impact the performance of programs.
B.	To choose the appropriate data structure and algorithm design method for a specified application.
C.	To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.
D.	Analyse and compare the different algorithms

Course Outcomes After the completion of this course, students will be able to:

1.	Be able to design and analyze the time and space efficiency of the data structure
2.	Analyze run-time execution of previous learned sorting methods, including selection, merge sort, heap sort and Quick sort
3.	Have practical knowledge on the applications of data structures
4.	Be capable to identity the appropriate data structure for given problem

SYLLABUS

1. Program to Find the Number of Elements in an Array
2. Develop and Implement a menu driven program in C for the following Array operations
    a. Creating Array of N Integer elements.
    b. Display of Array elements with suitable headings.
    c. Inserting an element (ELEM) at a given valid position (POS).
    d. Deleting an element at a given valid position (POS).
    e. Exit
3. Programs for Stack, Queues and Circular Queues using Arrays
4. Program to convert an Infix Expression into Postfix and Postfix Evaluation
5. Program to implement stack using arrays
6. Program to implement stack using linked list
7. Program to implement multiple stack in a single array
8. Program to convert infix notation to postfix notation using stacks
9. Program to implement queue using arrays
10. Program to implement queue using pointers
11. Program to reverse elements in a queue
12. Program to implement circular queue using arrays
13. Program to create add remove & display element from single linked list
14. Program to create add remove & display element from double linked list
15. Program to count number of nodes in linear linked list
16. Program to create add remove & display element from circular linked list
17. Programs to implement stack & queues using linked representation
18. Program to concatenate two linear linked lists
19. Program to accept a singly linked list of integers & sort the list in ascending order.
20. Program to reverse linked list
21. Program to represent polynomial using linked list
22. Program to add two polynomials using linked list
23. Program for the creation of binary tree, provide insertion & deletion in c
24. Program for pre-order, post-order & in-order traversals of a binary tree using non reccursive.
25. Program to count no, of leaves of binary tree
26. Program for implementation of B-tree (insertion & deletion)
27. Program for implementation of multi-way tree in c
28. Program for implementation of AVL tree
29. Program to implement bubble sort program using arrays
30. Program to implement merge sort using arrays
31. Program to implement selection sort program using arrays
32. Program to implement insertion sort program using arrays
33. Program to implement topological sort using arrays
34. Program to implement heap sort using arrays
35. Program to implement heap sort using pointers
36. Program to implement bubble sort program using pointers
37. Program to implement linear search using pointers
38. Program to implement binary search using pointers
39. Program to implement linear search using arrays
40. Program to implement binary search using arrays

Text books:

1. Baluja G S, “Data Structure through C”, Ganpat Rai Publication, New Delhi, 2015.
2. Pai G A V, “Data Structures and Algorithms: Concepts, Techniques and Applications”, 2ndEdn, Tata McGraw-Hill, 2008.
3. Horowitz E., Sahni S., Susan A., “Fundamentals of Data Structures in C”, 2nd Edition, University Press, 2010.

Reference books:

1. Tremblay J. P., Sorenson P. G, “An Introduction to Data Structures with Applications”, 2nd Edn, McGraw-Hill, Inc. New York, NY, USA.
2. Lipschutz Seymour, “Data Structures”, 6th Edn, 9th Reprint 2008, Tata McGraw-Hill.
3. Drozdek Adam, “Data Structures and Algorithms in C++”, Thomson Learning, New Delhi – 2007.
4. Feller J., Fitzgerald B., “Understanding Open Source Software Development”, Pearson Education Ltd. New Delhi

Gaps in the syllabus (to meet

Industry/Profession requirements): N/A POs

met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

POs met through Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

	Program Outcomes (POs)	**Program Specific Outcomes**

Course Outcome													**(PSOs)**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
CO1	3	3	3	3	2	1	2	2	1	2	1	1	2	3
CO2	3	3	3	3	2	1	2	2	2	1	1	2	2	3
CO3	3	3	3	3	2	1	2	2	1	2	1	2	3	3
CO4	3	3	3	3	2	2	2	2	2	2	2	2	3	2
CO5	3	2	2	1	2	3	1	1	1	2	2	2	3	3

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CS234
Course title: OOPDPLab
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV/II
Branch: CSE/IT

Course Objectives This course enables the students to:

1.	To introduce the student with fundamentals and features of Object Oriented programming.
2.	To be able to write a Java program to solve a well specified problem
3.	To be able to describe, recognize, apply and implement selected design patterns in Java
4.	To be familiar with common errors in Java and its associated libraries
5.	To understand a Java program written by someone else and be able to debug and test the same.

Course Outcomes After the completion of this course, students will be able to:

CO1	Work in any object oriented environment and program using those features.
CO2	Student will have hands on experience with all basic concepts of Java programming
CO3	Analyse the design pattern of the given problem and further solve with less complexity.
CO4	Use his/her programming skills to resolve the issues coming while programming for bigger problems.
CO5	Work in industry environment with good enough knowledge about Java and OOPs.

Syllabus

List of Programs as Assignments:

Lab Assignment No: 1

Objective: To understand and Implement basic java program concepts using Scanner class.

Q1. Take input from user a character variable in a program and if the value is alphabet then print "Alphabet" if it's a number then print "Digit" and for other characters print "Special Character"

Q2. Write a program to add all the values in a given number and check if the sum is prime number or not. Ex: 1234->10, not prime.

Lab Assignment No: 2

Objective: To Understand and Implement the concept of arrays in java

Q1. Write a program to find the largest 2 numbers and the smallest 2 numbers in the array initialized by the user.

Q2. Write a program to print the element of an array that has occurred the highest number of times Eg) Array -> 10,20,10,30,40,100,99 O/P:10

Lab Assignment No: 3

Objective: To Understand and Implement the concept of 2-D arrays in java.

Q1.Write a program to reverse the elements of a given 2*2 array. Four integer numbers needs to be passed as Command Line arguments

Eg: C:\>java Sample 1 2 3 4 O/P Expected :

The given array is : 1 2 3 4

The reverse of the array is : 4 3 2 1

Q2. Write a program to find greatest number in a 3*3 array. The program is supposed to receive 9 integer numbers as command line arguments.

Lab Assignment No: 4

Objective: To Understand and Implement the concept of classes and Constructors

Q1 . Create a class Box that uses a parameterized constructor to initialize the dimensions of a box.(dimensions are width, height, depth of double type). The class should have a method that calculates and returns the volume of the box . Obtain an object and print the corresponding volume in main() function.

Q2. Write a program in Java with class Rectangle with the data fields width, length, area and color. The length, width and area are of double type and color is of string type. The methods are set_length() , set_width() , set_color(), and find_area(). Create two object ofRectangle and compare their area and color. If area and color same for the objects then display “Matching Rectangles” otherwise display “Non Matching Rectangle”.

Lab Assignment No: 5

Objective: To Understand and Implement the concept of Inheritance

Q1.Create a class named ‘Animal’ which includes methods like eat() and sleep(). Create a child class of Animal named ‘Bird’ and override the parent class methods. Add a new method named fly(). Create an instance of Animal class and invoke the eat and sleep methods using this object.Create an instance of Bird class and invoke the eat, sleep and fly methods using this object.

Q2. A HighSchool application has two classes: the Person superclass and the Student subclass. Using inheritance, in this lab you will create two new classes, Teacher and CollegeStudent. A Teacher will be like Person but will have additional properties such as salary (the amount the teacher earns) and subject (e.g. “Computer Science”, “Chemistry”, “English”, “Other”). The CollegeStudent class will extend the Student class by adding a year (current level in college) and major (e.g. “Electrical Engineering”, “Communications”, “Undeclared”).

Lab Assignment No: 6

Objective: To Understand and Implement the concept of Overloading and Overriding

Q1.Create a class Account with two overloaded constructors. First constructor is used for initializing, name of account holder, account number and initial amount in account. Second constructor is used for initializing name of account holder, account number, address, type of account and current balance. Account class is having methods Deposit(), WithDraw(), and GetBalance().Make necessary assumption for data members and return types of the methods. Create objects of Account class and use them.

Q2. Create a base class Fruit which has name ,taste and size as its attributes. A method called eat() is created which describes the name of the fruit and its taste. Inherit the same in 2 other class Apple and Orange and override the eat() method to represent each fruit taste.

<u>Lab Assignment No: 7</u>

Objective: To Understand and Implement String class in Java

Q1. Reverse the string but not the words. Eg. I/P: Birla institute of technology O/P: technology of institute birla.

Q2. Find out and print the maximum possible palindrome in a given string. Eg: I/P: nononsene O/P: nonon

Q3.Given a string and a non-empty word string, return a string made of each char just before and just after every appearance of the word in the string. Ignore cases where there is no char before or after the word, and a char may be included twice if it is between two words.

If inputs are "abcXY123XYijk" and "XY", output should be "c13i". If inputs are "XY123XY" and "XY", output should be "13".

<u>Lab Assignment No: 8</u>

Objective: To Understand and Implement the concept of Abstract classes and Interfaces

Q1. Create an abstract class Compartment to represent a rail coach. Provide an abstract function notice in this class. Derive FirstClass, Ladies, General, Luggage classes from the compartment class. Override the notice function in each of them to print notice suitable to the type of the compartment. Create a class TestCompartment. Write main function to do the following: Declare an array of Compartment of size 10. Create a compartment of a type as decided by a randomly generated integer in the range 1 to 4. Check the polymorphic behavior of the notice method.

Q2.Write a program in java which implement interface Student which has two methods Display_Grade and Attendance for PG_Students and UG_Students (PG_Students and UG_Students are two different classes for Post Graduate and Under Graduate Students respectively).

<u>Lab Assignment No: 9</u>

Objective: To Understand and Implement Exception handling in java

Q1. Write a program in Java to display name and roll number of students. Initialize respective array variables for 10 students. Handle ArrayIndexOutOfBoundsException, so that any such problem does not cause illegal termination of program.

Q2. Write a program to accept name and age of a person from the command prompt(passed as arguments when you execute the class) and ensure that the age entered is >=18 and < 60. Display proper error messages. The program must exit gracefully after displaying the error message in case the arguments passed are not proper. (Hint : Create a user defined exception class for handling errors.)

Lab Assignment No: 10

Objective: To Understand and Implement File Handling and multithreading in java

Q1. Write a program to count the number of times a character appears in the Fileand also copy from one file to another. (Case insensitive... 'a' and 'A' are considered to be the same)

Q2. 1. Create class of SalesPersons as a thread that will display fives sales persons name. 2.

Create a class as Days as other Thread that has array of seven days.

2. Call the instance of SalesPersons in Days and start both the threads 4. suspendSalesPersons on Sunday and resume on wednesday Note: use suspend, resume methods from thread

Q3. Create two threads, one thread to display all even numbers between 1 & 20, another to display odd numbers between 1 & 20. Note: Display all even numbers followed by odd numbers Hint: use join

<u>Lab Assignment No: 11</u>

Objective: To Understand and Implement Applets, AWT and Swings

Q1. Program to create a calculator with the help of AWT packages in Java. Q2. Program to create a unit converter using Swings in Java.

Q3. APPLETS

a. Working with Frames and various controls.
b. Working with Dialogs and Menus.
c. Working with Panel and Layout.
d. Incorporating Graphics.
e. Working with colors and fonts.

Books recommended:

TEXT BOOKS

a. Krishna P. R., Object Oriented Programming through JAVA, 1st Edition, Universities Press, 2008.
b. Patrick Naghton& H. Schildt – The Complete Reference Java 2, Tata McGraw Hill Publication, New Delhi.
c. Dietel,Dietel - Java How to program , 7th edition; Pearson Education , New Delhi.

REFERENCE BOOKS

1. C. Horstmann,G. Cornell - Core Java 2 Vol I & Vol II ; Pearson Education , New Delhi.
2. Balagurusamy -Programming in Java, 2nd Edition; Tata McGraw Hill Publication; New Delhi.

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

POs met through Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO1	2	1	2	2	3	3	2	1	1	1	1	2	3	2
CO2	2	1	2	2	3	3	2	1	1	1	1	2	3	2
CO3	2	1	3	3	3	3	2	1	1	1	1	2	3	2
CO4	2	1	3	3	3	3	2	1	1	1	2	3	3	2
CO5	2	1	3	3	3	3	2	1	1	1	2	3	3	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: EE102
Course title: ELECTRICAL ENGINEERING LAB
Pre-requisite(s):
Credits: L T P 0 0 3
Class schedule per week: 3

Course Objectives This course enables the students :

A.	To describe students practical knowledge of active and passive elements and operation of measuring instruments
B.	To demonstrate electrical circuit fundamentals and their equivalent circuit models for both 1-φ and 3- φ circuits and use circuit theorems
C.	To establish voltage & current relationships with the help of phasors and correlate them to experimental results
D.	1. To conclude performance of 1 – Φ AC series circuits by resonance phenomena 2. To evaluate different power measurement for both 1-φ and 3- φ circuits

Course Outcomes After the completion of this course, students will be able to:

1.	classify active and passive elements, explain working and use of electrical components, different types of measuring instruments;
2.	illustrate fundamentals of operation of DC circuits, 1-φ and 3- φ circuits and also
	correlate the principles of DC, AC 1-φ and 3- φ circuits to rotating machines like Induction motor and D.C machine.;
3.	measure voltage, current, power, for DC and AC circuits and also represent them in phasor notations;
4.	analyse response of a circuit and calculate unknown circuit parameters;
5.	recommend and justify power factor improvement method in order to save electrical energy.

SYLLABUS

LIST OF EXPERIMENTS :

Name: Measurement of low & high resistance of DC shunt motor

Aim: (i) To measure low resistance of armature winding of DC shunt motor

(ii) To measure high resistance of shunt field winding of DC shunt motor

Name: AC series circuit

Aim: (i) To obtain current & voltage distribution in AC RLC series circuit and to draw phasor diagram

ii. To obtain power & power factor of single phase load using 3-Voltmeter method and to draw phasor diagram

Name: AC parallel circuit

Aim: (i) To obtain current & voltage distribution in AC RLC parallel circuit and to draw phasor diagram

ii. To obtain power & power factor of single phase load using 3-Ammeter method and to draw phasor diagram

Name: Resonance in AC RLC series circuit

Aim : (i) To obtain the condition of resonance in AC RLC series circuit

ii. To draw phasor diagram

Name: 3 phase Star connection

Aim : (i) To establish the relation between line & phase quantity in 3 phase star connection

ii. To draw the phasor diagram

Name: 3 phase Delta connection

Aim : (i) To establish the relation between line & phase quantity in 3 phase delta connection

ii. To draw phasor diagram

Name: 3 phase power measurement

Aim : (i) To measure the power input to a 3 phase induction motor using 2 wattmeter method

ii. To draw phasor diagram

Name: Self & mutual inductance

Aim : To determine self & mutual inductance of coils

Name: Verification of Superposition, Thevenin's and Reciprocity theorem

Aim : (i) To verify Superposition theorem for a given circuit

ii. To verify Thevenin's theorem for a given circuit

Name: Verification of Norton's, Tellegen's and Maximum Power transfer theorem

Aim : (i) To verify Norton's theorem for a given circuit

ii. To verify Maximum Power transfer theorem for a given circuit

Gaps in the syllabus (to meet Industry/Profession requirements)

1. Application of principles of magnetic circuits to electrical machines like transformers, generators and motors
2. Visualize Phase sequence

POs met through Gaps in the Syllabus :a, b, c, g
Topics beyond syllabus/Advanced topics/Design

1. Assignment : Simulation of electrical circuits with dependent/independent sources by various techniques (Mesh current/Node Voltage/Thevenin's theorem/Norton's theorem/Maximum power transfer theorem etc.) using MATLAB/PSIM/C++ softwares
2. Active/reactive power calculation for 3 – Φ circuits

POs met through Topics beyond syllabus/Advanced topics/Design: e,f, i, j, k

Mapping of lab experiment with Course Outcomes

Experiment	**Course Outcomes**			
	1	**2**	**3**	**4**
1	3	3	3	2
2	3	3	3	3
3	3	3	3	3
4	3	3	3	3
5	3	3	3	1
6	3	3	3	1
7	3	3	3	2
8	3	3	3	3
9	3	3	3	2
10	3	3	3	2

3=High, 2=Medium, 1=Low

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors
CD2	Tutorials/Assignments
CD3	Mini projects/Projects
CD4	Laboratory experiments/teaching aids
CD5	Self- learning such as use of NPTEL materials and internets
CD6	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
(1) Progressive Evaluation (60)	
Day to Day performance & Lab files	30
Quiz (s)	10
Viva	20
(2) End Semester (40)	
Examination Experiment performance	30
Quiz	10
Grand Total	100

Assessment Compoents	CO1	CO2	CO3	CO4	CO5
Progressive Evaluation Marks					
End Semester Marks					

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Course Objectives

Course Outcome #	Course Objectives			
	A	B	C	
1	3	3	3	
2	3	3	3	
3	3	3	3	3
4	3	3	3	3
5	2	3	3	3

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
CO1	2	2	2	1	1	1	2	2	1	2	1	1	1	1
CO2	3	3	3	1	2	2	2	2	1	2	1	1	2	1
CO3	3	3	3	2	2	2	2	2	1	2	1	1	3	2
CO4	3	3	3	2	2	2	2	2	2	2	1	1	3	2
CO5	3	3	3	3	3	2	3	3	3	3	2	2	3	3

Mapping of Course Outcomes onto Program Educational Objectives

Course Outcome #	Program Educational Objectives		
	1	2	3
1	3	3	2
2	3	3	3
3	3	3	3
4	3	3	3
5	3	3	2

Mapping Between COs and Course Delivery (CD) methods

Course Outcome	Course Delivery Method
CO1	CD1,CD2,CD4, CD5
CO2	CD1,CD4,CD5
CO3	CD1,CD3,CD4,CD5,CD6
CO4	CD1,CD2,CD4, CD5
CO5	CD4, CD5

(Semester IV)

COURSE INFORMATION SHEET

Course code: MA 203
Course title: Numerical Methods
Pre-requisite(s): NIL
Co- requisite(s): ---NIL
Credits: L: 2 T: 0 P: 0 C: 2
Class schedule per week: 2 Lectures
Class: B Tech
Semester / Level: 2
Branch: ALL
Name of Teacher:

Course Objectives: This course enables the students to

1.	derive appropriate numerical methods to solve algebraic and transcendental equations
2.	derive appropriate numerical methods to solve linear system of equations
3.	approximate a function using various interpolation techniques
4.	to find the numerical solution of initial value problems and boundary value problems

Course Outcomes: After the completion of this course, students will be able to

CO 1	solve algebraic and transcendental equation using an appropriate numerical method arising in various engineering problems
CO 2	solve linear system of equations using an appropriate numerical method arising in computer programming, chemical engineering problems etc.
CO 3.	Approximate a function using an appropriate numerical method in various research problems
CO 4	evaluate derivative at a value using an appropriate numerical method in various research problems
CO 5	solve differential equation numerically

Syllabus
MA 203 Numerical Methods 2-0-0-2

Module I: Errors and Nonlinear Equations

Error Analysis: Definition and sources of errors, propagation of errors, floating-point arithmetic **Solution of Nonlinear equations:** Bisection method, Regula-Falsi method, Secant method, Newton-Raphson method and its variants, General Iterative method.
[05L]

Module II: System of Linear Equations

Gauss-Elimination, Gauss-Jordan, LU-Decomposition, Gauss-Jacobi and Gauss- Siedel methods to solve linear system of equations and Power method to find least and largest eigenvalues.
[05L]

Module III: Interpolation

Lagrange's interpolation, Newton's divided differences interpolation formulas, inverse interpolation, interpolating polynomial using finite differences. [05L]

Module IV: Differentiation and Integration

Differentiation using interpolation formulas, Integration using Newton-Cotes formulas: Trapezoidal rule, Simpson's rule
[05L]

Module V: Solution of Ordinary Differential Equations

Euler's method, modified Euler's method, Runge - Kutta Methods of second and fourth order to solve initial value problems.
[05L]

Text Books:

1. Jain M.K, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age Publications, 2004.
2. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI.
3. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Reference Books:

1. S.C. Chapra and R. P. Canale, Numerical Methods for Engineers, McGraw Hill, 1985.
2. C.F. Gerald and P.O. Wheatley, Applied Numerical Analysis, Pearson Education, Seventh Edition, 2003.
3. R. W. Hamming: Numerical Methods for Scientists and Engineers, Second Edition, Dover

Course delivery methods	
Lecture by use of boards/lcd projectors/ohp projectors	
Tutorials/assignments	
Seminars	
Mini projects/projects	
Laboratory experiments/teaching aids	
Industrial/guest lectures	
Industrial visits/in-plant training	
Self- learning such as use of nptel materials and internets	
Simulation	

Course outcome (co) attainment assessment tools & evaluation procedure

Direct assessment

Assessment tool	% contribution during co assessment
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment components	CO1	CO2	CO3	CO4	CO5
Mid semester examination	√	√	√		
End semester examination	√	√	√	√	√
Quiz (s)	√	√	√		
Assignment	√	√	√	√	

Indirect assessment –

1. Student feedback on course outcome

Mapping of course outcomes onto program outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	2	1	1	1	2	1	2	1	1	3	2	1
CO2	3	3	3	2	2	1	1	2	1	2	1	2	3	3	1
CO3	3	3	2	3	2	2	2	2	2	2	1	1	2	2	1
CO4	2	2	3	3	2	2	2	2	3	3	2	2	2	2	1
CO5	2	3	3	3	3	2	2	2	2	2	2	2	3	3	1

If satisfying< 34%=1, 34-66% =2, > 66% = 3.

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: MT 131
Course title: Understanding Harmony
Credits: 1 (L: 3, T:0, P:0)
Class schedule per week: 3
Class: B. Tech
Semester / Level: 4
Branch: Mechanical Engineering

Syllabus

Module	Hours
Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education 1. Purpose and motivation for the course, recapitulation from Universal Human Values-I. 2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations. 4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario 6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.	8
Module 2: Understanding Harmony in the Human Being - Harmony in Myself! 1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. 2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. 3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). 4. Understanding the characteristics and activities of 'I' and harmony in 'I'. 5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. 6. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available tome. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.	8
Module 3: Understanding Harmony in the Family and Society- Harmony in Human, Human Relationship 1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship 2. Understanding the meaning of Trust; Difference between intention and competence 3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship 4. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals 5. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.	8
Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence 1. Understanding the harmony in the Nature 2. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. 3. Understanding Existence	8

as Co-existence of mutually interacting units in all- pervasive space. 4. Holistic perception of harmony at all levels of existence. 5. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.	
Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics 1. Natural acceptance of human values 2. Definitiveness of Ethical Human Conduct 3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order 4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. 5. Case studies of typical holistic technologies, management models and production systems 6. Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers b) At the level of society: as mutually enriching institutions and organizations 7. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. to discuss the conduct as an engineer or scientist etc.	8

Text books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference books:

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.

5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews

7. Economy of Permanence - J C Kumarappa

8. Bharat Mein Angreji Raj - PanditSunderlal

9. Rediscovering India - by Dharampal

10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English)

COURSE INFORMATION SHEET

Course code: CS237
Course title: Database Management System (DBMS)
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	Understand the fundamental concepts, historical perspectives, current trends, structures, operations and functions of different components of databases.
2.	Recognize the importance of database analysis and design in the implementation of any database application.
3.	Describe the role of transaction processing in a database system.
4.	Understand various concurrency control mechanisms for a database system.
5.	Describe the roles of recovery and security in a database system.

Course Outcomes

After the completion of this course, students will be able to:

1.	Analyze data organization requirements and their inter relationships.
2.	Illustrate the features of data models and their application for storing data.
3.	Design queries to maintain and retrieve useful information from the databases created.
4.	Analyze the physical database design with respect to their expected performance using normalization and query processing.
5.	Examine the best practices according to concepts of indexing, transaction control and concurrency maintenance

Syllabus

Module I
Database Design and Entity - Relational Model

Purpose of Database System; View of Data, Database Languages, Transaction Management, Database architecture, Database Users and Administrator, Types of database System, Overview of design process, E-R model, Constraints, E–R Diagram, E-R Diagram issues, Weak Entity Sets, Extended E – R Features, Reduction to E–R Schemas.
(8L)

Module II
Relational Model

Structure of Relational Database, Codd's Rules, Fundamental Relational Algebra Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations, Data definition, Basic structure of SQL queries, Set Operations, Aggregate Functions, Null Values, Nested Sub Queries, complex queries, views, modification of database, Joined relations, SQL data types & schemas, Integrity constraints, authorization, Embedded SQL, Triggers.
(8L)

Module III
Relational Database Design

Functional dependency, Decomposition, Normalization, First normal form, Second normal form, Third normal form, BCNF, Multivalued dependencies and Fourth normal form, Join dependencies and Fifth normal form, DKNF. (8L)

Module IV
Indexing & Hashing

Ordered Indices, B+ Tree index files, B-Tree index files, Multiple key access Static hashing, Dynamic Hashing, Comparison of ordered indexing and hashing, Index definition in SQL.
Query Processing

Measure of Query Cost, Selection Operation, Evaluation of Expressions. (8L)

Module V
Transaction & Concurrency Control
Transaction Concepts & ACID Properties, Transaction States, Implementation of Atomicity & Durability, Concurrent Executions, Serializability& Its Testing, Recoverability, Lock-Based protocols, Validation based protocol, Multiple Granularity, Multiversion Schemes, Deadlock Handling. (8L)

Text Book:

Silberschatz A. et.al, Database System Concepts, 6th Edition, Tata Mc-Graw Hill, New Delhi, 2011. (T1)

Reference Books:

Elmasri R., Fundamentals of Database Systems, 7thEdition, Pearson Education, New Delhi, 2016. (R1)

Ullman Jeffrey D et.al., A First course in Database Systems, 3rd Edition, Pearson Education, New Delhi- 2014.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5

Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO1	2	1	2	2	3	3	2	1	1	1	1	2	3	2
CO2	3	1	2	2	3	3	2	1	1	1	1	2	3	2
CO3	3	1	3	3	3	3	2	1	1	2	1	2	3	2
CO4	3	1	3	3	3	3	2	1	1	2	2	3	3	2
CO5	2	1	3	3	3	3	2	1	1	1	2	3	3	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS241
Course title: Design and Analysis of Algorithm
Pre-requisite(s):
Co- requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: II/2
Branch: CSE/IT

Course Objectives This course enables the students to:

1.	To analyze the performance of recursive and nor-recursive algorithms.
2.	To understand various algorithm design techniques.
3.	To use of different paradigms of problem solving.
4.	To find efficient ways to solve a given problem.
5.	To compare various algorithms of a given problem.

Course Outcomes After the completion of this course, students will be able to:

1.	Define the concepts and mathematical foundation for analysis of algorithms.
2.	Explain different standard algorithm design techniques, namely, divide & conquer, greedy, dynamic programming, backtracking and branch & bound.
3.	Demonstrate standard algorithms for fundamental problems in Computer Science.
4.	Design algorithms for a given problem using standard algorithm design techniques.
4	Analyze and compare the efficiency of various algorithms of a given problem.

SYLLABUS

Module I
Algorithms and Complexity

Introduction, Algorithm Complexity and various cases using Insertion Sort, Asymptotic Notations, Time complexity of Recursive Algorithm, Solving Recurrences using Iterative, Recursion Tree and Master Theorem. (8L)

Module II
Divide and Conquer

Discussion of basic approach using Binary Search, Merge Sort , Quick Sort , Selection in Expected linear time, Maximum Subarray , Matrix Multiplication , Introduction of Transform and Conquer and AVL Tree . (8L)

Module III
Dynamic Programming

Introduction and Approach, Rod Cutting, LCS, Optimal BST, Transitive closure and All-pair Shortest Path, Travelling Salesperson Problem. (8L)

Module IV
Greedy and other Design Approaches

Introduction to greedy using fractional knapsack, Huffman Code, Minimum Spanning Tree – Prim and Kruskal, Single Source Shortest Path Dijkstra’s and Bellman-Ford, Introduction to Backtracking using N-Queens problem, Introduction to Branch and Bound using Assignment Problem or TSP. (8L)

Module V
NP Completeness and Other Advanced Topics

Non-deterministic algorithms – searching and sorting, Class P and NP, Decision and Optimization problem, Reduction and NPC and NPH, NP Completeness proof for: SAT, Max-Clique, Vertex Cover, Introduction to Randomized Algorithms, Introduction to Approximation Algorithms. (8L)

Text Book:

1. Cormen Thomas H. et al., Introduction to Algorithms. 3rd Edition, PHI Learning, latest edition.(T1)

Reference Books:

1. Horowitz E., Sahani, Fundamentals of Computer Algorithms, Galgotia Publication Pvt. Ltd. (R1)
2. Dave and Dave, Design and Analysis of Algorithms, 2^{nd} Edition, Pearson. (R2)
3. Goodrich, Tamassia. Algorithm Design. Wiley. (R3)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
CO1	2	2	3	2	1	1	1	1	1	2	1	2	3	3
CO2	2	2	3	2	1	1	1	1	1	2	1	2	3	3
CO3	2	2	3	2	1	1	1	1	1	2	2	2	3	3
CO4	3	3	3	3	2	1	1	1	1	2	2	3	3	3
CO5	3	3	3	3	2	1	1	1	1	2	2	3	3	3

Correlation Levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS239
Course title: Operating System
Pre-requisite(s):
Co- requisite(s): None Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: BTech
Semester / Level: V
Branch: CSE/IT

Course Objectives This course enables the students to:

1.	Present the main components of OS and their working
2.	Introduce the concepts of process and thread and their scheduling policies
3.	Handling synchronization of concurrent processes and deadlocks
4.	Analyze the different techniques for managing memory, I/O, disk and files
5.	Design the components of operating system

Course Outcomes After the completion of the course student will be able to:

1.	Describe the main components of OS and their working
2.	Explain the concepts of process and thread and their scheduling policies
3.	Solve synchronization and deadlock issues
4.	Compare the different techniques for managing memory, I/O, disk and files
5.	Design components of operating system

Syllabus

Module I [8L]
Operating system Overview

Operating system Objective and Functions, Evolution of Operating System, Major Advances in OS Components, Characteristics of Modern Operating Systems
Process Description and Control

Process Concept, Process States, Process Description, Process Control, Threads, Types of Threads, Multicore and Multithreading

Module II [8L]
Scheduling

Type of scheduling, Uniprocessor Scheduling, Multiprocessor Scheduling

Module III [8L]
Concurrency
Mutual Exclusion and Synchronization

Principle of Concurrency, Mutual Exclusion, Hardware Support, Semaphores, Monitors, Message Passing, Readers/Writers Problem
Deadlock and Starvation

Principle of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Dining Philosopher Problem

Module IV [8L]
Memory Management

Memory Management Requirements, Memory Partitioning, Paging, Segmentation
Virtual Memory

Hardware and Control Structures, Operating System Policies for Virtual Memory

Module V [8L]
I/O Management and Disk Scheduling

I/O device, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling, RAID, Disk Cache
File Management

Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, File Allocation and Free Space Managemen

Text Book:

1. StallingsW., Operating systems - Internals and Design Principles, , 8th Edition, Pearson, 2014.

Reference Books:

1. SilberchatzAbraham, Galvin Peter B.,Gagne Greg, Operating System Principles, 9th Edition, Wiley Student Edition, 2013.
2. Tanenbaum Andrew S., Modern Operating Systems, 4th Edition, Pearson, 2014.
3. Dhamdhere D. M. ,Operating Systems A concept - based Approach, 3rd Edition, McGrawHill Education, 2017.
4. Stuart B. L., Principles of Operating Systems, 1st Edition, 2008, Cengage learning, India Edition.
5. Godbole A. S., Operating Systems, 3rd Edition, McGrawHill Education, 2017.

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
CO1	2	2	2	2	1	1	2	1	1	1	1	2	2	2
CO2	2	2	2	2	1	1	2	1	1	1	1	2	2	2
CO3	2	2	3	2	2	2	2	2	1	2	1	3	3	2
CO4	3	3	3	3	2	2	2	2	2	2	2	3	3	3
CO5	3	2	2	2	2	3	1	1	1	1	1	1	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS238
Course title: **Database Management system Lab**
Pre-requisite(s): CS301 Database Management System
Co- requisite(s):
Credits: L:0 T:0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV/III
Branch: CSE/IT

Course Objective
This course enables the students:

1.	Learn and practice data modeling using the entity-relationship and developing database designs.
2.	Understand the use of Structured Query Language (SQL) and learn SQL syntax.
3.	Understanding the basic principles of modeling of database using UML and apply normalization techniques to normalize the database system.
4.	Learn Multidimensional schemas suitable for data warehousing. And learn the Difference between OLTP (Online Transaction Processing) and OLAP (Online Analytical Processing).
5.	To demonstrate the principles behind the logical database design and Data Warehouse Modeling.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Describe the fundamental elements of relational database management systems.
CO2	Explain the basic concepts of relational data model, entity-relationship model,relational database design, relational algebra and SQL.

CO3	Design ER-models to represent simple database application scenarios.
CO4	Convert the ER-model to relational tables, populate relational database and formulate SQL.
CO5	Improve the database design by normalization.

SYLLABUS

List of Programs as Assignments:

Lab Assignment No: 1

Objective: Implementation of DDL commands of SQL with suitable examples

- Create table
- Alter table
- Drop Table

Lab Assignment No: 2

Objective: Implementation of DML commands of SQL with suitable examples

- Insert
- Update
- Delete

Lab Assignment No: 3

Objective: Implementation of different types of function with suitable examples

- Number function
- Aggregate Function
- Character Function
- Conversion Function
- Date Function

Lab Assignment No: 4

Objective: Study & Implementation of PL/SQL.

Lab Assignment No: 5

Objective Implementation of different types of operators in SQL

- Arithmetic Operators
- Logical Operators
- Comparison Operator
- Special Operator

- Set Operation

Lab Assignment No: 6

Objective: Implementation of different types of Joins

- Inner Join
- Outer Join
- Natural Join etc..

Lab Assignment No: 7

Objective: Study & Implementation of SQL Triggers.

Lab Assignment No: 8

Objective:

- Creating Database /Table Space
- Managing Users: Create User, Delete User
- Managing roles:-Grant, Revoke.

Lab Assignment No: 9

Objective: Study and Implementation of

- Group By & having clause
- Order by clause
- Indexing

Lab Assignment No: 10

Objective: Study & Implementation of

- Sub queries
- Views

Lab Assignment No: 11

Objective: Study & Implementation of different types of constraints.

Books recommended:

TEXT BOOKS

4. A.Silberschatz et.al - Database System Concepts, 5thEd^{n}, Tata Mc-Graw Hill, New Delhi – 2000.

REFERENCE BOOKS

3. Date C.J. - An Introduction to Database System, Pearson Education, New Delhi, 2005.
4. R.Elmasri, Fundamentals of Database Systems, Pearson Education, New Delhi, 2005.

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	2	3	3	1	1	2	2	1	3	3	3	3
CO2	3	3	2	3	3	2	1	1	2	2	2	1	3	3	3
CO3	3	3	2	3	2	3	1	2	2	2	2	1	3	3	3
CO4	3	2	3	2	3	3	1	2	2	3	3	1	3	3	3
CO5	3	3	3	3	2	2	2	2	2	1	2	1	3	1	2

COURSE INFORMATION SHEET

Course code: CS240
Course title: **Shell and Kernel Programming Lab**
Pre-requisite(s): Operating System, UNIX Programming
Co- requisite(s): NIL
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV/III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the basic concepts of UNIX & shell programming.
2.	Understand the basic operations of an operating system.
3.	To explore the function of a kernel.
4.	To understand the basic function of a device driver.
5.	To understand the structure of a file system.

Course Outcomes
After the completion of this course, students will be able to:

1.	Explain the design of Linux kernel components
2.	Experiencing the kernel by passive/active observation
3.	Extend the Linux kernel for understanding, self-satisfaction/falsification.
4.	Identify the current research trends in OS, Linux being the reference OS
5.	Illustrate the design of Linux kernel components

Syllabus
Module I
Introduction to UNIX, file system, system calls, AWK script, Bourne shell programming. (8L)
Module II
Korn Shell Programming, C Shell Programming, Different tools & Debuggers. (8L)
Module III
Introduction: OS concepts catch-up, Linux kernel overview, Extending the kernel: building a modified kernel, writing simple kernel modules, User-kernel interfacing: system calls, proc/sys, character devices, device memory maps, Kernel execution contexts: processes, threads, kernel threads, interrupts, bottom halves/soft IRQs. (8L)
Module IV
Process management: Linux kernel scheduler, context switching, kernel synchronization
Memory management: Virtual memory, page cache, File systems: The VFS layer, Kernel-File system interfacing. (8L)

Module V
Generic block layer: Block I/O interfacing, kernel block I/O scheduler
Device drivers: Device probe and software / hardware configurations, event registration, communication. (8L)

Text Books:

HARWANI B.M., UNIX and Shell Programming, First Publication,Oxford University Press, 2013. (T1)
Love Robert, Linux Kernel Development, 3rd Edition.(T2)
Corbet Jonathan, Kroah-Hartman Greg, Rubini Alessandro, Linux Device Drivers, 3rd Edition. (T3)
Bovet Daniel P. , CesatiMarco,Understanding the Linux Kernel, Publisher: O'Reilly.(T4)
Nutt Gary, Kernel Projects for Linux, Addison Wesley, ISBN: 0-201-61243-7, July 2000.(T5)

References Books:

Sarwar Syed Mansoor, Koretsky Robert, & Sarwar Syed Aqeel ,Linux: The Textbook Addison Wesley, ISBN: 0-201-72595-9. (R1)
Gagné Marcel, Linux System Administration: A User's Guide, Addison Wesley, ISBN: 0-201-71934-7 Paperback, September 2001. (R2)
Rubini Alessandro & Corbet Jonathan ,Linux Device Drivers, O'Reilly & Associates, ISBN 0-596-00008-1Paperback, June 2001.(R3)
Bar Moshe, Linux File Systems, McGraw-Hill; ISBN: 0-07-212955-7 Paperback.(R4)

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	3	2	3	1				1		1	3	2	3
CO2	3	2	3	2	3	3	1	3		2	1	1	3	2	3
CO3	2	2	3	2	3	1						1	3	2	3
CO4	3	2	3	2	3	2	1	3		2	1	1	3	2	3
CO5	3	2	3	2	3	3	1	2		2	1	2	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: MA204
Course title: Numerical Methods Lab
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 2 C:1
Class schedule per week: 2
Class: B. Tech
Semester / Level: III/II
Branch: All

Course Objectives This course enables the students to understand

1.	derive appropriate numerical methods to solve algebraic, transcendental equations and linear system of equations
2.	approximate a function using various interpolation techniques, to find the numerical solution of initial value problems
3.	ncepts in probability theory, the properties of probability distributions
4.	estimation of mean, variance and proportion, the concepts of statistical hypothesis

Course Outcomes After the completion of this course, students will be able to

1.	solve algebraic, transcendental equation and linear system of equations using an appropriate numerical method arising in various engineering problems
2.	evaluate derivative at a value using an appropriate numerical method in various research problems, solve differential equation numerically
3.	learn basic probability axioms, rules and the moments of discrete and continuous random variables as well as be familiar with common named discrete and continuous random variables.
4.	find the point and interval estimates, analyse data statistically and interpretation of the results

Syllabus

List of Assignments

1. Find a simple root of using bisection method. Read the end points of the interval in which the root lies, maximum number of iterations and error tolerance eps.
2. Find a simple root of using Regula-Falsi method. Read the end points of the interval in which the root lies, maximum number of iterations and error tolerance eps.
3. Find a simple root of using Newton Raphson method. Read any initial approximation maximum number of iterations and error tolerance eps.
4. Solution of a system of linear equations using Gauss elimination method with partial pivoting. The program is for system or higher order system.
5. Matrix inversion and solution of system of equations using Gauss-Jordan method. If the system of equations is larger than change the dimensions of the float statement.
6. Program to solve a system of equation using Gauss-Seidel iteration method. Order of the matrix is , maximum number of iterations , error tolerance is eps and the initial approximation to the solution vector is . If the system of equations is larger than change the dimension in float.
7. Program to find the largest Eigen value in magnitude and the corresponding Eigen vector of a square matrix of order using power method.
8. Program for Lagrange interpolation.
9. Program for Newton divided difference interpolation.
10. Program for Newton's forward and backward interpolation.
11. Program for Gauss's central difference interpolation (both backward and forward).
12. Program to evaluate the integral of between the limits to using Trapezoidal rule of integration based on subintervals or nodal points. The values of and are to be read. The program is tested for
13. Program to evaluate the integral of between the limits to using Simpson's rule of integration based on subintervals or nodal points. The values of and are to be read and the integrand is written as a function subprogram. The program is tested for

14. Program to solve an IVP, using Euler method. The initial value the final value and the step size are to be read. The program is tested for

15. Program to solve an IVP, using the classical Runge-Kutta fourth order method with step size , and also computes the estimate of the truncation error. Input parameters are: initial point, initial value, number of intervals and the step length h. Solutions with , and the estimate of the truncation error are available as output. The right hand

    side The program is tested for .

Text Books:

1. S.S.Sastry-Introductory Methods of Numerical Analysis-PHI, Private Ltd., New Delhi.
2. N.Pal& S. Sarkar- Statistics: Concepts and Applications, PHI, New Delhi-2005.

Reference Books:

1. R.V.Hogg et.al- Probability and Statistical Inpane, 7th Edn, Pearson Education, New Delhi-2006.
2. R.L.Burden&J.D.Faires- Numerical Analysis, Thomson Learning-Brooks/Cole, Indian Reprint, 2005.

<u>Gaps in the syllabus (to meet Industry/Profession requirements): N/A</u>

<u>POs met through Gaps in the Syllabus: N/A</u>

<u>Topics beyond syllabus/Advanced topics/Design: through experiments</u>

<u>involving design/modelling of device/circuits on advanced topics</u>

<u>POs met through Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics</u>

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets

CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure
Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Progressive Evaluation	(60)
Attendance Marks	12
Lab file Marks	12
Viva Marks	24
Day-to-day performance Marks	12
End SEM Evaluation	(40)
Lab quiz Marks	20
Lab performance Marks	20

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Progressive Evaluation	√	√	√	√	√
End SEM Evaluation	√	√	√	√	√

If satisfying < 34% = 1, 34-66% = 2, > 66% = 3

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

<u>Mapping between Objectives and Outcomes</u>

Mapping of Course Outcomes onto Program Outcomes

	Program Outcomes	**Program**

Course Outcome	(POs)												Specific Outcomes (PSOs)	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
CO1	2	2	3	2	1	1					1	2	2	3
CO2	2	2	3	2	1	1				2	1	2	2	3
CO3	2	2	3	2	1	1			1	2	2	2	2	3
CO4	3	3	3	2	1	1	2	2	1	2	2	3	3	3
CO5	3	3	3	2	1	1	2	2	1	2	2	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

(Semester V)

COURSE INFORMATION SHEET

Course code: IT331
Course title: Image Processing
Pre-requisite (s):,
Co- requisite(s):
Credits: L: 3 T:0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level:
Branch: CSE/IT

Course Objectives This course enables the students:

1.	Understand the basic concept of Digital Image Processing
2.	To Learn the Fourier Transform& its application
3.	Understand the basic components of filters
4.	Understand the basic concept of Image Compression Fundamentals
5.	Understand the basic concept of Image Segmentation.

Course Outcomes After the completion of this course, students will be:

1.	Understand the concept of image formation, digitization, and role human visual system plays in perception of image data and spatial filtering techniques for enhancing the appearance of an image.
2.	Acquire an appreciation for various frequency based filtering techniques for enhancing the appearance of an image, duly applying them in different applications.
3.	Discern the difference between noise models, gain an insight into assessing the degradation function and realize different spatial and frequency based filtering techniques for reduction and removal of noise.
4.	Synthesize a solution to image compression using the concept of information theory and lossless and lossy compression techniques.
5.	Design and create practical solutions using morphological and image segmentation
6.	operators for common image processing problems and assess the results.

Syllabus

Module I [8 L]

Introduction to Digital Image Processing, Elements of Visual Perception, Image Sensing & Acquisition, Sampling and Quantization, Basic Relationships between Pixels, Intensity Transformations, Histogram Processing, Spatial Convolution & Correlation, Smoothing Spatial Filters, Sharpening Spatial Filters.

Module II 8 L]

Introduction to the Fourier Transform, Discrete Fourier Transform, Properties of the Two-Dimensional Fourier Transform, Image Smoothing using Frequency Domain filters, Image Sharpening using Frequency Domain filters, Selective Filtering, Basics of Fast Fourier Transform, Basics of: Walsh- Hadamard Transform; K-L Transform; Discrete Cosine Transform.

Module III [8 L]

Model of Image Degradation/Restoration Process, Noise Probability Density Functions, Restoration in presence of Noise only, Periodic Noise Reduction using Frequency Domain filtering, Circulant Matrices, Block Circulant Matrices, Unconstrained Restoration, Constrained Restoration, Basics of Inverse Filtering

Module IV [8 L]

Image Compression Fundamentals – Coding Redundancy, Interpixel Redundancy, Psychovisual Redundancy, Fidelity Criteria, Image Compression Models– Source Encoder and Decoder, Channel Encoder and Decoder, Elements of Information Theory, Error-Free Compression – Variable-Length Coding, Bit-Plane Coding, Lossless Predictive Coding. Lossy Compression – Lossy Predictive Coding, Transform Coding.Color Fundamentals, Color Models, Basics of Full Color Image Processing

Module V [8 L]

Morphological Image Processing-Preliminaries, Dilation and Erosion, Opening and Closing, Hit- or-Miss Transformation, Boundary Extraction, Hole Filling, Connected Components, Convex Hull, Thinning, Thickening, Skeletons, Pruning Image Segmentation-Fundamentals,Point, Line and Edge Detection, Thresholding, Region Based Segmentation, Segmentation based on color.

Text books:

1. Rafael. C. Gonzalez & Richard E. Woods- Digital Image Processing, 3/e Pearson Education, New Delhi - 2009

Reference books:

1. W.K.Pratt-Digital Image Processing, 4/e, John Wiley & sons, Inc. 2006.
2. M. Sonka et al. Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition, 2007.
3. Jayaraman, Digital Image Processing, Tata McGraw-Hill Education, 2011ii.

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO1	3	3	3	2	2		1					2	3	3
CO2	3	3	3	2	2	1	1					2	3	3
CO3	3	3	3	3	2	1	1					2	3	3
CO4	3	3	3	3	2	1	1					2	3	3
CO5	3	3	3	3	3	2	1	1	1	1		2	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT333
Course title: Data Communication & Computer Network
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives This course enables the students to:

1.	Study the components of the data communication model and communications architecture.
2.	Understand the differences and similarities between the OSI model and the TCP model.
3.	Understand the fundamentals of the theory of signalling.
4.	Understand the basic principles of signal encoding techniques, error-detection, and error-correction techniques.
5.	Understand the characteristics of analog signaling and digital signaling and the strengths and weaknesses of each method.

Course Outcomes After the completion of this course, students will be able to:

1.	Identify the elements of a communication network.
2.	Illustrate different data communications and networking standards.
3.	Design and implement a simple LAN and a WAN that meet a specific set of criteria.
4.	Identify the new trends and technologies, their potential applications.
5.	Examine the social impact of the networking technology particularly on issues related to security and privacy.

Syllabus

Module I: Data Communications and Networking Overview

A Communications Model, Data Communications, Data Communication Networking, The Need for Protocol Architecture, A Simple Protocol Architecture, OSI, The TCP/IP Protocol Architecture, Data TransmissionConcepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity.

(8L)

Module II: **Transmission Media and Signal Encoding Techniques:**

Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission.Digital Data Digital Signals, Digital Data Analog Signals, Analog Data Digital Signals, Analog Data Analog Signals. (8L)

Module III: **Digital Data Communication Techniques and Data Link Control:**

Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations, Interfacing, Flow Control, Error Control, High-Level Data Link Control (HDLC). (8L)

Module IV: Multiplexing, Circuit Switching and Packet Switching Multiplexing

Frequency Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing, Switching Networks, Circuit-Switching Networks, Circuit-Switching Concepts, Control Signaling, Soft switch Architecture, Packet-Switching Principles, X.25, and Frame Relay. (8L)

Module V : Asynchronous Transfer Model

Protocol Architecture, ATM Logical Connections, ATM Cells, Transmission of ATM Cells, ATM Service Categories, ATM Adaptation Layer.

Routing in Switched Networks

Routing in Circuit-Switching Networks, Routing in Packet-Switching Networks, Least-Cost Algorithms. (8L)

Text Book:

Stallings W., Data and Computer Communications, 10thEdn., Pearson Education, PHI, New Delhi, 2014.(T1)

Reference Book:

Forouzan B. A., Data Communications and Networking, 5thEdn. TMH, New Delhi, 2017.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
CO1	3	2	2	2	2	1	1			2	2	3	3	3
CO2	3	2	2	2	2	1	1		2	2	2	3	3	3
CO3	3	3	2	2	2	2	1		2	3	2	3	3	3
CO4	3	3	3	3	3	2	2	2	2	3	3	3	3	3
CO5	3	3	3	3	3	2	2	2	2	3	3	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT335
Course title: Data Mining Concepts and Technique Lab
Pre-requisite(s): IT426 Data Mining Concepts and technique
Co- requisite(s):
Credits: L:0 T:0 P:1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives This course enables the students to:

1.	Explain about the necessity of preprocessing and its procedure.
2.	Generate and evaluate Association patterns
3.	Solve problems using various Classifiers
4.	Learn the principles of Data mining techniques and various mining algorithms.
5.	Learn about traditional and modern data driven approach and problem solving techniques for various datasets

Course Outcomes After the completion of this course, students will be able to:

CO1	Understand Data Warehousing and Data Mining and its applications and challenges and Create mini data warehouse.
CO2	Apply the association rules for mining applications .
CO3	Identify appropriate Classification techniques for various problems with high dimensional data.
CO4	Implement appropriate Clustering techniques for various problems with high dimensional data sets.
CO5	Implement various mining techniques on complex data objects.

SYLLABUS

List of Programs as Assignments:

Q1. Build a Data Warehouse and Explor WEKAtool.
Q2. Demonstration of preprocessingon various datasets.
Q3.Demonstration of Association rule process on dataset using apriori algorithm.
Q4.Demonstrate performance of classification on various data sets.

Q5. Demonstrate performance of clustering on various data sets.
Q6. Demonstrate performance of Regression on various datasets
Q7. Implement following algorithms for various datasets

1. Apriori Algorithm.
2. FP-Growth Algorithm.
3. K-means clustering.

Q8. Implement Bayesian Classification for various datasets

Q9 Implement Decision Tree for various datasets.

Q10. Implement Support Vector Machines.

Q11 Applications of classification for web mining.

Q12. Case Study on Text Mining or any commercial application

Books recommended:

Text Books :

1. Jiawei Han & Micheline Kamber - Data Mining Concepts & Techniques Publisher Harcout India. Private Limited.

Reference Books :

1. G.K. Gupta – Introduction to Data Mining with case Studies, PHI, New Delhi – 2006.
2. A. Berson& S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004.
3. H.M. Dunham & S. Sridhar – Data Mining, Pearson Education, New Delhi, 2006.

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u>

Implementing of real world problems

POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO1	3	3	2	3	2	2	2	1	2	3	3	3	3	3
CO2	2	3	2	3	2	2	1	2	2	3	3	3	2	2
CO3	2	3	3	3	3	3	3	2	3	3	3	3	2	2
CO4	3	2	2	3	3	2	2	1	3	3	3	3	3	3
CO5	3	3	3	3	2	2	2	1	3	3	3	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT332
Course title: Image Processing lab
Pre-requisite(s): Discrete Mathematics
Co- requisite(s): Data Structures
Credits: L:0 T:0 P:1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives

This course enables the students:

1.	Understand the basic concept of Digital Image Processing
2.	To Learn the Fourier Transform& its application
3.	Understand the basic components of filters
4.	Understand the basic concept of Image Compression Fundamentals
5.	Understand the basic concept of Image Segmentation.

Course Outcomes

After the completion of this course, students will be:

1.	Understand the concept of image formation, digitization, and role human visual system plays in perception of image data and spatial filtering techniques for enhancing the appearance of an image.
2.	Acquire an appreciation for various frequency based filtering techniques for enhancing the appearance of an image, duly applying them in different applications.
3.	Discern the difference between noise models, gain an insight into assessing the degradation function and realize different spatial and frequency based filtering techniques for reduction and removal of noise.
4.	Synthesize a solution to image compression using the concept of information theory and lossless and lossy compression techniques.
5.	Design and create practical solutions using morphological and image segmentation operators for common image processing problems and assess the results.

Syllabus

1. Write a C Program to display header information of 16 color .bmp image.
2. Program to enhance image using image arithmetic and logical operations.
3. Program for an image enhancement using pixel operation.
4. Program for gray level slicing with and without background.
5. Program for image enhancement using histogram equalization.Program to filter an image using averaging low pass filter in spatial domain,and median filter.
6. Program to sharpen an image using 2-D laplacian high pass filter in spatial domain.
7. Program for detecting edges in an image using Roberts cross gradientoperator and sobel operator.
8. Program for smooth an image using low pass filter in frequency domain . (Butterworth lpf)
9. Program for smooth an image using high pass filter in frequency domain . (Butterworth hpf)
10. Program for morphological image operations-erosion, dilation, opening & closing.
11. Program for illustrating color image processing.
12. Program for image Watermarking.

Text books:

1. Rafael. C. Gonzalez & Richard E. Woods- Digital Image Processing, 3/e Pearson Education, New Delhi - 2009

Reference books:

1. W.K.Pratt-Digital Image Processing, 4/e, John Wiley & sons, Inc. 2006.
2. M. Sonka et al. Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition, 2007.
3. Jayaraman, Digital Image Processing, Tata McGraw-Hill Education, 2011

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO1	3	3	3	2	2	2			2	1	2	2	3	3
CO2	3	3	3	2	2	1			2	1	2	2	3	3
CO3	3	3	3	3	2	1			2	1	2	2	3	3
CO4	3	3	3	3	2	1			2	1	2	2	3	3
CO5	3	3	3	3	3	2	1	1	2	1	2	2	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT334
Course title: DCCN Lab
Pre-requisite(s):
Co- requisite(s): None
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B.Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	To familiarize the student in introducing and exploring various Network topologies and networking protocols
2.	To understand the use of client/server architecture in application
3.	To enable the student on how to approach for networking problems using networking simulation tools.
4.	To Design reliable servers using both TCP and UDP sockets
5.	Familiarwithnetworktoolsandnetworkprogramming.

Course Outcomes
After the completion of this course, students will be able to:

CO1	Express programming & simulation for networking problems.
CO2	Understand of various aspects of networking devices
CO3	Design and implement simulation of a simple LAN and a WAN that meet a specific set of criteria
CO4	Identify the elements of a communication network
CO5	Simulate various OSI layer protocols using C/C++/ Java

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No.:1**

Q1. To familiarize with the Lab Network Topology, Locating different interfaces, routers and switches. Studying different pools of IP addresses.

Q2. Implement the data link layer framing methods such as character, character stuffing, and bit stuffing.

Q3. To learn and observe the usage of different networking commands e.g.PING, TRACEROUTE. Learning remote login using telnet session. Measuringtypical average delays between different locations of the network.

2. **Lab Assignment No: 2**

Q1. What is the IP of the machine you are using? Compare it with the IP of your neighbors.Are the IPs of your neighbors same? Why or Why not?

Q2. Ping" is a tool used to determine if a server is responding and to estimate the round triptime of a message sent to that server. Use the ping command for the following URLs andrecord the success or failure statistics along with the average round trip time.

a. google.com
b. facebook.com
c. bitmesra.ac.in

Q3. Trace the route that is taken when you try to access:

a. google.com
b. facebook.com
c. bitmesra.ac.in

Q4. Network Commands on Linux / Unix

3. **<u>Lab Assignment No: 3</u>**

Q1. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC 32.

Q2. Implementation of Sub-netting and Super-netting.

Q3. To study different types of transmission media, various topologies, and configure modem of computer HUB and Switches.

4. **<u>Lab Assignment No: 4</u>**

Q1. Write a C/C++ program to determine if the IP address is in Class A, B, C, D, or E.

Q2. Write a C/C++ program to determine if the IP address is in Class A, B, or C.

Q3. Write a C/C++ program to translate dotted decimal IP address into 32 bit address.

Q4. To implement a routing protocol and check its connectivity in a variable length subnet masked network

Q5. Write a C/C++ program to perform bit stuffing and de-stuffing.

5. **Lab Assignment No: 5**

Q1. Implement Dijkstra‘s algorithm to compute the Shortest path through a graph.

Q2. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm

Q3. Take an example subnet of hosts. Obtain broadcast tree for it.

6. **Lab Assignment No: 6**

Q1. Build implementations of the Internet protocols
Q2. Implementation of Stop and Wait Protocol and Sliding Window Protocol. Q3. Write a code simulating ARP /RARP protocols.

7. **Lab Assignment No: 7**

Q1. Create a socket for HTTP for web page upload and download
Q2. Write a code simulating PING and TRACEROUTE commands.

8. **Lab Assignment No: 8**

Q1. Study and implement model for Socket Programming and Client – Server model. Q2. Experiments with NS2(or any other simulator) to study behavior (especially performance of) link layer protocols such as Ethernet and802.11 wireless LAN..

9. **Lab Assignment No: 9**

Q1. Experimental study of applicationprotocolssuch as HTTP, FTP,SMTP, using network packetsniffersandanalyzerssuchas**Wireshark**. Small exercisesinsocketprogramming in C/C++/Java..

10. **Lab Assignment No: 10**

Q1. Take a 64 bit playing text and encrypt the same using DES

algorithm. Q2. Write a program to break the above DES coding

Q3. Using RSA algorithm encrypts a text data and Decrypt the samebjective: To Understand and Implement Data Interpolation

11. Assignment No: 11

Q1. Applications using TCP and UDP Sockets like d. DNS e. SNMP f. File Transfer

Q2.Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS

Q3.Echo client and echo server b. Chat c. File Transfer

Books recommended:

Text Books

1. William Stallings, Data and Computer Communication, Prentice Hall of India. (T1)
2. Behrouz A. Forouzan, Data Communication and Networking, McGraw-Hill. (T2)
3. Andrew S. Tanenbaum, Computer Networks, Prentice Hall.(T3)

Reference books

1. W. Richard Stevens, TCP/IP Illustrated, Volume 1, Addison-Wesley.(R1)
2. Douglas Comer, Internetworking with TCP/IP, Volume 1, Prentice Hall of India.(R2)

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO1	3	2	2	2	2	1	1			2	2	3	3	3
CO2	3	2	2	2	2	1	1		2	2	2	3	3	3
CO3	3	3	2	2	2	2	1		2	3	2	3	3	3
CO4	3	3	3	3	3	2	2	2	2	3	3	3	3	3
CO5	3	3	3	3	3	2	2	2	2	3	3	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT336
Course title: Data Mining Concepts and Techniques Lab
Pre-requisite(s):
Co- requisite(s): None
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B.Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To teach efficient storage mechanisms of data for an easy access and Complexity analysis.
2	To design and implementation of various basic and advanced data structures concepts.
3.	To introduce various techniques for representation of the regular and non-regular data in the real world.
4.	To develop application using data structures techniques and concepts.
5.	To improve the logical ability.

Course Outcomes
After the completion of this course, students will be able to:

1.	Student will be able to choose appropriate data structure concepts as applied to specified problem definition.
2.	Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures Techniques and concepts.
3.	Students will be able to apply concepts learned in various domains like DBMS, compiler construction, Networking etc.
4.	. Students will be able to use linear data structures like stacks, queues, linked list and non-linear data structures like Trees.
5.	Implement Data Structures for solving real world problems efficiently.

Syllabus

Module I

Data Structures – Introduction to Data Structures, abstract data types, Single and Multi-dimensional Arrays, Sparse Matrices, Time and Space Complexity, Asymptotic notations, Analyzing recursive and non-recursive problems. **(8 Lectures)**

Module II

Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, circular linked list implementation, Double linked list implementation, insertion, deletion and searching operations. Applications of linked lists. **(8 Lectures)**

Module III

Stacks-Operations, array and linked representations of stacks, stack applications -infix to postfix conversion, postfix expression evaluation, recursion implementation, Queues-operations, array and linked representations, Circular Queue operations, Dequeues, priority queues, Applications of queues. **(8 Lectures)**

Module IV

Trees – Definitions, tree representation, properties of trees, Binary tree, Binary tree representation, binary tree properties, binary tree traversals, Construction of Binary tree, Binary Search tree, Applications of Binary Search tree, AVL tree, M-way Search Tree, B-Tree and B+ Tree. **(8 Lectures)**

Module V

Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, shell sort, radix sort, Searching-linear and binary search methods, comparison of sorting and searching methods.

(8 Lectures)

Text Book:

1. Fundamentals of Data structures in C, 2nd Edition, E.Horowitz, S.Sahni and Susan Anderson-Freed, Universities Press, 2020 (New Edition).
2. Data structures A Programming Approach with C, D.S.Kushwaha and A.K.Misra, PHI, October, 2014.
3. Mark Allen Weiss, "Data Structures and Algorithms Analysis in Ja a Pearson Education, 3rd edition, 2012.

Reference Book:

1. Data structures and Algorithm Analysis in C, 2nd edition, M.A.Weiss, Pearson.
2. Data Structures using C, A.M.Tanenbaum,Y. Langsam, M.J.Augenstein, Pearson.
3. Aaron M. Tenenbaum, Moshe J. Augenstein, yedidyahlangsam, " C**:, Second edition, PHI,2009.
4. Goodrich, M. and Tamassia, R. "Data Sfructures and Algorithms Analysis in Java", 4th Edition, Wiley,2013.

Gaps in the syllabus (to meet Industry/Profession requirements): **Not Applicable**

POs met through Gaps in the Syllabus: : P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	First Quiz: 10 Mid Semester Examination: 25 Second Quiz: 10 Teacher's Assessment: 5
Semester End Examination	End Semester Examination: 50

Continuous Internal Assessment	% Distribution
Mid semester examination	25% (Mid Semester Examination: 25)
Two quizzes	20% (Quiz-1 + Quiz-2)
Teacher's Assessment	5% (Attendance: 5)

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments

CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1
CO2	2	2	1	1	1	1	1	1	1	1	1	2	1	1	1
CO3	3	3	3	1	2	1	1	1	1	1	1	2	2	3	1
CO4	3	3	2	2	2	1	2	2	1	1	1	2	3	2	1
CO5	2	2	3	2	3	1	1	2	1	1	1	2	3	3	2

Mapping Between Course Outcomes And Course Delivery Method

Course Outcomes	Course Delivery Method
CO1	CD1, CD6
CO2	CD1, CD6, CD7
CO3	CD1, CD2, CD3, CD6, CD7
CO4	CD1, CD3, CD6, CD7
CO5	CD1, CD2, CD3, CD4, CD5, CD7

COURSE INFORMATION SHEET

Course code: IT340
Course title: Internet and Web Technology Lab
Pre-requisite(s):
Co- requisite(s): None
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B.Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

This course enables the students:

A.	To provide students with a fundamental understanding as to how an XHTML-compliant web site is developed, implemented, and maintained. XHTML
B.	To provide students with a fundamental understanding as to how an Cascading Style Sheets- is developed and implemented.
C.	To provide basic understanding of java script to help in designing of web pages.
D.	To understand the need of Dom model.
.E	To provide the role of xml in web design

Course Outcomes

After the completion of this course, students will be able to do the following:

1.	Describe the components of the Internet and Web technology
2.	Analyse common Internet applications such as marketing, collaboration, electronic commerce and document management
3.	Explain the basics of Internet technology, such as http and the World Wide Web, HTML, and JavaScripts;
4.	Create WWW pages to serve as front-end to client/server, Internet applications

5	Analyzing and designing Internet applications and testing and documenting the solutions developed.

SYLLABUS

1. Write an HTML code to display your education details in a tabular format.
2. Write an HTML code to display your CV on a web page.
3. Write an HTML code to create a Home page having three links: About Us, OurServices and Contact Us. Create separate web pages for the three links.
4. Write an HTML code to create a login form. On submitting the form, the usershould get navigated to a profile page.
5. Write an HTML code to create a Registration Form. On submitting the form, theuser should be asked to login with this new credentials.
6. Write an HTML code to create your Institute website, Department Website and tutorial website for specific subject.
7. Write an HTML code to illustrate the usage of the following:
   - Ordered List
   - Unordered List
   - Definition List
8. Write an HTML code to create a frameset having header, navigation andcontent sections.
9. Write an HTML code to demonstrate the usage of inline CSS.
10. Write an HTML code to demonstrate the usage of internal CSS.

11. Write an HTML code to demonstrate the usage of external CSS.

12. Write a Java script to prompt for users name and display it on the screen.

13. Design HTML form for keeping student record and validate it using Java script.

14. Write an HTML program to design an entry form of student details and send itto store at database server like SQL, Oracle or MS Access.

15. Write programs using Java script for Web Page to display browsers information.

16. Create an applet which will have a line, an Oval & a Rectangle

17. Writing program in XML and create a style sheet in CSS & display the documentin internet explorer.

18. Write an XML program to display products

19. Write a program using PHP and HTML to create a form and display the detailsentered by the user

Text books:

1. Deitel H.M. and P. J. Deitel, Internet & World Wide Web. How to Program, 5/e, Prentice Hall, ISBN0131752421, 2013.

Reference books:

1.Internet and Web Technologies by Raj kamal, McGraw Hill Education (1 July 2017)

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u>

<u>POs met through Gaps in the Syllabus:</u>

<u>Topics beyond syllabus/Advanced topics/Design:</u>

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	3	2	3	1				1		1	3	2	3
CO2	3	2	3	2	3	3	1	3		2	1	1	3	2	3
CO3	2	2	3	2	3	1						1	3	2	3
CO4	3	2	3	2	3	2	1	3		2	1	1	3	2	3
CO5	3	2	3	2	3	3	1	2		2	1	2	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

(Semester VI)

COURSE INFORMATION SHEET

Course code: IT337
Course title: **Software Engineering**
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: VI
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	Students are effective team members, aware of cultural diversity, who conduct themselves ethically and professionally
2.	Students use effective communication skills and technical skills to assure production of quality software, on time and within budget.
3.	Students build upon and adapt knowledge of science, mathematics, and engineering to take on more expansive tasks.
4.	Able to increase level of self-reliance, technical expertise, and leadership.

Course Outcomes

After the completion of this course, students will be:

1.	Explain the software engineering principles and techniques
2.	Apply Software Project Management Practices
3.	Apply the knowledge gained for their project work as well as to develop software following software engineering standards
4.	Develop self-reliance, technical expertise, and leadership.

Syllabus

Module I
Introduction

Some Definitions, FAQs about software engineering, the evolving role of software, Software process models, Waterfall model, the prototyping model, spiral model, RAD and Incremental model, Management activities, Project planning and Project Scheduling. (8L)

Module II
Software Requirements

Functional and non-functional requirements, User requirements, System requirements, the software requirements document. IEEE standard of SRS, Quality of good SRS.

Requirement Engineering Process: Feasibility study, Requirements elicitation and analysis, Requirements validation, Requirement management. (8L)

Module III

Design Engineering

Design Process and Design Quality, Design Concepts, Design Models, Object oriented Design, UML: Class diagram, Sequence diagram, Collaboration diagram. (8L)

Module IV

Verification and Validation

Verification and Validation Planning, S/W inspection, static analysis.

Software Testing

Testing functions, Test care design, White Box testing, Black box testing, Unit testing, Integration Testing, System testing, Reliability. (8L)

Module V

Process metrics, Software Measurement, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Quality assurance and standards, Quality planning, Quality control, **S**/W Maintenance in detail. (8L)

Text Book:

Sommerville, Software Engineering, 7th Edition, Pearson Education Publication. (T1)

Reference Books:

Pressman R. S.,Software Engineering: A Practiioners Approach, 5th Edition., TMA, New Delhi.(R1)

Mall Rajib, Fundamental of Software Engineering, 4th Edition, PHI Learning Private Limited.(R2)

Peters J. F. &Pedrycz W., Software Engineering, John Wiley & Sons, Inc. 2000.(R3)

Behforooz A. & Hudson F.J., Software Engineering Fundamentals, Oxford Univ. Press, New York, 2000.(R4)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	3	3	3	1	1	2	1	2	3	3	1	1	1	3	2
2	2	3	1	2	2	2	2	2	2	3	2	1	1	2	3
3	2	3	3	3	3	1	1	1	2	3	1	2	2	3	3
4	3	1	2	1	2	1	2	2	1	1	1	2	2	3	2
5	2	2	1	2	3	1	1	1	1	3	2	3	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course Code: CS335
Course Title: Artificial Intelligence and Machine Learning
Pre-requisite(s): CS241 Design and Analysis of Algorithm
Co- requisite(s): AI and ML Lab.
Credits: L: 3 T: 1 P: 0
Class schedule per week: 4
Class: B.Tech
Semester / Level: 5
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the need of artificial intelligence in solving real world problems.
2	To learn various search techniques.
3.	To understand various knowledge representation techniques.
4.	To understand the basic concept of machine learning.
5.	To learn the concepts of neural networks and clustering techniques.

Course Outcomes
After the completion of this course, students will be able to:

1.	Apply different search techniques for solving real world problems and select the most appropriate solution by comparative evaluation.
2.	Analyze the various concepts of knowledge representations and demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
3.	Demonstrate the concepts of probabilistic reasoning.
4.	Implement machine learning solutions to classification, regression, and clustering problems
5.	Design and implement various machine learning algorithms in a range of real-world applications

Syllabus

Module I

Introduction to AI. Overview of Artificial Intelligence, Examples of AI systems, AI Technique, Explaining AI through Tic-Tac-Toe Problem.

Search Techniques: Solving Problems by Searching: an overview. Conventional vs Heuristic Search Strategies. Hill Climbing Search, Simulated Annealing Search, Greedy Best-First Search, A* Search. Constraint Satisfaction Problems. Mini-Max Search Procedure, Alpha-Beta Pruning.

Module II

Knowledge & Reasoning: Knowledge Representation & Mapping.

Predicate Logic: FOPL, Clausal Form, Resolution. Forward Verses Backward Reasoning, Matching.

Module III

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, Bayesian Networks, Dempster-Shafer Theory.

Planning: Overview, Components of A Planning System, Goal Stack Planning, Hierarchical

Planning.

Module IV

Introduction to Machine learning: Machine Learning – what and why?

Concepts of Noise, bias-variance trade-off, underfitting and overfitting. Linear Regression. Logistic regression. Decision Tree.

Module V

Neural Networks: Introduction, gradient descent training. Multilayer networks and back propagation.

Clustering. Hierarchical Clustering, Partitional clustering, Density-based clustering. Purity Measures.

Text Book:

1. Russel S. and Norvig P., Artificial Intelligence a Modern Approach, 3rd edition, Pearson Education.

Reference Book:

1. Rich E. & Knight K., Artificial Intelligence, 3rd edition, TMH, New Delhi.

2. Mitchell Tom, Machine Learning, Latest Edition, Mc-Graw Hill.

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	
Semester End Examination	

Continuous Internal Assessment	% Distribution
Mid semester examination	
Two quizzes	
Teacher's Assessment	

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	
CD2	
CD3	
CD4	
CD5	
CD6	
CD7	

Mapping of Course Outcomes onto Program Outcomes

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1															
CO2															
CO3															
CO4															
CO5															

COURSE INFORMATION SHEET

Course code: MT204
Course title: Constitution of India
Pre-requisite(s):
Co- requisite(s):
Credits: L: 2 T: 0 P: 0
Class schedule per week: 2
Class: B. Tech
Semester / Level: VI/II
Branch: CSE/IT

Course Objectives:

This course enables the students:

A.	To describe the importance and role of Constitution of India
B.	To resolve the social problems and issues.
C.	To maintain and bolster the unity and integrity in the society.
D.	To formulate and design policies in accordance with the constitutional provisions.

Course Outcomes

After the completion of this course, students will be:

1.	Outlinethe need and importance of the Indian constitution.
2.	Explain the fundamental rights and duties of the citizens of India.
3.	Relate appropriate constitutional provisions with relevant social issues
4.	Describe the role of different departments of government.
5.	Crique the Government policies and programmes designed for the society at large.

Syllabus

Module 1: Introduction to the Constitution of India, Salient Features of the Constitution: Sources andconstitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Module 2: Union and State Executives: President and Prime Minister, Council of Ministers, Cabinetand Central Secretariat, Lok Sabha, Rajya Sabha.Governor: Role and Position, Chief Ministers and Council of ministers.

Module 3: The Indian Judicial System – The Supreme Court and The High Court's – composition,Jurisdiction and functions, The Role of the Judiciary.

Module 4: Local Government- District's Administration: Role and Importance, The Panchayatas –Gram Sabha, Constitution and Composition of Panchayatas ,Constitution and Composition of Municipalities

Module 5: Miscellaneous- Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Readings

1. The Constitution of India by " Ministry of Law India" Kindle Edition
2. Constitutional History of India by Prof.M.V.PYLEE-S.Chand Publishing
3. Indian Administration by Avasti and Avasti-Lakshmi Narain Agarwal Educational Publishers.2017 edition.
4. Introduction to the Constitution of India by D DBasu by Lexis Nexis : 20th edition.
5. Constitution of India V.N.Shukla's EBC Explorer Edition 13th ,2017

Gaps in the syllabus (to meet Industry/Profession

requirements)POs met through Gaps in the Syllabus

Topics beyond syllabus/Advanced topics/Design

POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods
1.Lecture by use of boards/LCD projectors/OHP projectors
2. Tutorials/Assignments
3. Seminars
4. Mini projects/Projects
5.Laboratory experiments/teaching aids
6.Industrial/guest lectures
7.Industrial visits/in-plant training
8.Self- learning such as use of NPTEL materials and internets
9.Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Mid Sem Examination Marks	25
End SemExamination Marks	60
Assignment / Quiz (s)	15

AssessmentCompoents	CO1	CO2	CO3	CO4	CO5
Mid Sem Examination Marks	√	√			
End Sem Examination Marks	√	√	√	√	√
Assignment	√	√	√		

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1						3	3	3	3	3		2	1	1	1
CO2						3	3	2	3	3		2	1	1	2
CO3						1	3	3	3	3		2	1	1	1
CO4						3	2	2	3	3		2	1	1	1
CO5						3	3	3	3	3		1	1	1	1

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1
CD2	Tutorials/Assignments		CO2	CD1
D3	Seminars		CO3	CD1, CD2
CD4	Mini projects/Projects		CO4,	CD1, CD2
CD5	Laboratory experiments/teaching aids		CO5	CD1, CD3, CD6
CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			

<u>(SEMESTER VI-LABORATORIES)</u>

COURSE INFORMATION SHEET

Course code: IT338
Course title: Software Engineering & Testing Lab
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T:0 P: 3
Class schedule per week:
3Class: B. Tech
Semester / Level:
IIIBranch: CSE/IT

Course Objectives

This course enables the students to:

1.	Familiarize the students with the fundamental concepts of Software Engineering
2.	Impart state-of-the-art knowledge on SRSand UML
3.	Explore case studies to demonstrate practical applications of different concepts
4.	Provide a platform where they can solve real life problems

Course Outcomes

After the completion of this course, students will be able to:

CO1	Prepare efficient models for development of software for various projects
CO2	Collect the requirements the client wants for the software being produced
CO3	Design the UML diagrams necessary for the software being developed
CO4	Create and specify feasible software designs based on the requirements/specifications
CO5	Assess the extent and costs of a project with the help of several different assessment methods

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No: 1**

Objective: To Understand and Implement Identification of Requirements from Problem Statements

Q1. To consider the problem statement for a project to be developed and list out the ambiguities, inconsistencies and incompleteness of the problem statement.

Q2. To identify different functionaries to be obtained from a system and characteristics that a system should have, but not possessed by the system itself

2. **Lab Assignment No: 2**

Objective: To Understand and Implement Estimation ofProject Metrics

Q1. To estimate the minimum size of the team one would require to develop a project through application of intermediate COCOMO.

Q2. To use Halstead's metrics to estimate the effort required to recreate a program in JAVA from C.

3. **Lab Assignment No: 3**

Objective: To Understand and Implement Modeling UML Use Case Diagrams and Capturing Use Case Scenarios

Q1. To draw a use case diagram for the given case study.

Q2. To identify the primary and secondary actors for the system and generalization of use cases and «include» stereotypes to prevent redundancy in the coding phase.

4. **Lab Assignment No: 4**

Objective: To Understand and Implement E-R Modeling from the Problem Statements

Q1. To identify the possible entity sets, their attributes, and relationships for the given case study.

Q2. To draw an ER diagram for the given case study.

5. **Lab Assignment No: 5**

Objective: To Understand and Implement Identification of Domain Classes from the Problem Statements

Q1. To identify potential classes and their attributes for the given case study.

Q2. To utilize expert knowledge on the subject matter to identify other relevant classes.

6. **Lab Assignment No: 6**

Objective: To Understand and Implement Identification of Components from the Problem Statements

Q1. To identify potential components for the given case study.

Q2. To draw component diagram for the given case study

7. **Lab Assignment No: 7**

Objective: To Understand and Implement State Chart and Activity Modeling

Q1. To draw a statechart diagram to graphically represent the given case study.

Q2. To draw an activity diagram to graphically represent the workflow of the given case study.

8. **Lab Assignment No: 8**

Objective: To Understand and Implement Modeling UML Class Diagrams and Sequence diagrams

Q1. To draw class diagram for the given case study.

Q2. To draw sequence diagram for the given case study.

9. Lab Assignment No: 9

Objective: To Understand and Implement Modeling Data Flow Diagrams

Q1. To draw data flow diagram (Level 0, 1 and 2) for the given case study.

10. Lab Assignment No: 10

Objective: To Understand and Implement Estimation of Test Coverage Metrics and Structural Complexity

Q1. To identify the basic blocks for a given program

Q2. To draw a CFG using the basic blocks

Q3. To determine McCabe's complexity from a CFG.

11. Lab Assignment No: 11

Objective: To Understand and Implement Designing Test Suites

Q1. To design a test suite for the given case study.

Q2. To verify implementation of functional requirements by writing test cases.

Q3. To analyze results of testing to ascertain the current state of the project.

12. Lab Assignment No: 12

Objective: To Understand and Implement Forward and Reverse Engineering

Q1. To obtain programs from UML diagrams.

Q2. To obtain UML diagrams from programs.

Books recommended:

TEXT BOOKS

1. Software Engineering, Ian Sommerville, Pearson, 10th Edition, 2016.**(T1)**
2. Software Engineering: A Practioner's Approach, Roger S. Pressman, McGraw Hills, 7th Edition, 2009.**(T2)**

REFERENCE BOOKS

1. Fundamentals of Software Engineering, Rajib Mall, Prentice-Hall of India, 3rd Edition, 2009.**(R1)**

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus: PO2, 5 & 6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	1	3	2	2	1	1	1	1	3	1	3	3
CO2	3	2	1	1	2	1	1	1	2	1	3	3	3	2	3
CO3	3	3	2	1	3	2	2	1	3	3	1	3	3	3	3
CO4	2	3	2	2	3	3	2	3	3	2	3	3	3	3	2
CO5	3	1	1	3	2	2	3	1	2	1	2	2	1	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2, CD3, CD6, CD7
CO2	CD1, CD2, CD3, CD7
CO3	CD1, CD2, CD3, CD6, CD7
CO4	CD1, CD2, CD3,CD6
CO5	CD1,CD2, CD3, CD6, CD7

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects

CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

PROGRAMME ELECTIVE -I

COURSE INFORMATION SHEET

Course code: IT345
Course title: **UI Design**
Pre-requisite(s):
Co- requisite(s):NIL
Credits: L:0 T: 0 P: 1.5
Class schedule per week:
Class: B. Tech
Semester / Level: V

Course Objectives
This course enables the students

1.	To impart the basic concepts of User Interface Design.
2.	To develop understanding about human computer interaction methods that utilize more general, widespread and easier-to-learn capabilities.
3.	The cognitive and perceptual constraints that affect interface design
4.	Techniques for evaluating the usability of an interface
5	How to communicate the results of a design process, both in oral and written form

Course Outcomes
After the completion of this course, students will be able to do the following:

1.	Identify the key terms related to user interfaces and user interface design and implementation
2.	Identify and describe various types of computer users and computer use contexts
3.	Identify and describe various types of user interfaces
4.	Describe and explain the user interface design process
5	Identify and describe common abstract user interface components, such as radio buttons and group boxes

Syllabus
Module I

Introduction: Importance of user interface – definition, importance of good design, brief history – Graphical User Interface – Web User Interface – Theories, Principles and Guidelines of User interface design. (7L)

Module II

Design Process: Obstacles in development path deigning for people-Understanding Human Interaction with computers, Importance of Human Characteristics, Human consideration, Human Interaction speeds – Understanding Business function. (8L)

Module II

Screen Designing: Design goals - screen meaning and purpose, organizing screen elements ordering of screen data and content – screen navigation and flow – visually pleasing composition – amount of information – focus and emphasis – presenting information simply and meaningfully – information retrieval on web – Statistical graphics – Technological considerations in Interface Design. (8L)

Module IV

Menus and navigation schemes: structures of menus-functions of menus- contents of menus - formatting of menus – phrasing the menu- selecting menu choices-navigating menus-kinds of graphical menus- Selection of windows-Window characteristics-components of windows-window presentation styles-types of windows-window management-organising window functions-window operations-Selection of device based and screen based controls - text and messages – icons and images – Multimedia – colours- uses, problems, choosing colours. (8L)

Module V

Distributed and Collaborative Interaction: Device consistency-distribution of the user interface-event distribution-graphical package layer-programmable API-Model semantics distribution-data layer distribution-asynchronous collaboration-Software tools-specification methods- interface building tools –evaluation and critiquing tools-Interaction devices keyboard and function keys - pointing devices- speech recognition, digitization and generation – image and video displays – printers. (9L)

Text books:

Wilbert O. Galitz,"The Essential Guide to User Interface Design", 3rd Edition, Wiley Dreamtech,Delhi, 2007.(T1)

Shneiderman Ben, "Designing the User Interface", 5th Edition, Pearson Education Asia, Delhi, 2014.(T2)

Reference books:

Olsen Dan R., "Human Computer Interaction",Cengage, New Delhi,2009.(R1)

Carroll John M.,"Human Computer Interaction", Pearson Education Asia, Delhi, 2002.(R2)

Cooper Alan, "The Essentials of User Interface Design ", Wiley Dreamtech, Delhi, 2002.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcome onto Program Outcome

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	3	2	3	1	1	2	1	2	1	2	3	2	3
CO2	2	3	3	3	2	3	2	2	2	3	2	3	3	2	3
CO3	3	3	3	3	3	3	1	2	2	3	2	3	3	3	3
CO4	3	3	3	3	3	1	1	1	2	2	2	3	3	2	3
CO5	3	3	3	2	3	2	2	1	2	2	1	2	3	3	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS445
Course title: **Information and Coding Theory**
Pre-requisite(s): MA303 Discrete Mathematics
Co- requisite(s): NIL

Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives

This course enables the students:

1.	To understand the role of information theory for an efficient, error-free and secure delivery of information using binary data streams.
2.	To have a complete understanding of error-control coding.
3.	To understand encoding and decoding of digital data streams.
4.	To introduce methods for the generation of these codes and their decoding techniques.
5.	To have a detailed knowledge of compression and decompression techniques.
6	To evaluate the performance of various coding techniques over noisy communication channels

Course Outcomes
After the completion of this course, students will be:

1.	To be able to understand the principles behind an efficient, correct and secure transmission of digital data stream.
2.	To be familiar with the basics of error-coding techniques.
3.	To have knowledge about the encoding and decoding of digital data streams.
4.	Generation of codes and knowledge about compression and decompression techniques.
5.	To be able to understand the performance requirements of various coding techniques.
6	To produce professionals who will be able to conduct research in information theory.

Syllabus
Module I
Source Coding-Introduction to Information Theory, Uncertainty and Information, Average Mutual Information and Entropy, Information Measure for Continuous Random Variables, Source coding theorem, Huffman Coding, Shannon- Fano -Elias Coding, Arithmetic Coding , The Lempel-Ziv ,Algorithm , Run Length Encoding.
And the PCX Format, Rate Distribution Function, Optimum Quantizer Design, Entropy Rate of a Stochastic Process, Introduction to Image Compression, The JPEG Standard for Lossless

Compression, The JPEG Standard for Lossy Compression. (8L)

Module II

Channel Capacity and Coding- Introduction, Channel Model, Channel Capacity, Channel Coding, Information Capacity Theorem, the Shannon Limit, Channel Capacity for MIMO System, Random Selection of Code. Error Control Coding (Channel Coding). (8L)

Module III

Linear Block Codes for Error Correction- Introduction to Error Correction Codes, Basic Definitions, Matrix Description of Linear Block Codes , Equivalent Codes , Parity Check Matrix, Decoding of Linear Block Code ,Syndrome Decoding, Error Probability after Coding (Probability of Error Correction), Perfect Codes, Hamming Codes, Low Density Parity Check (LDPC) Codes , Optimal Linear Codes, Maximum Distance Separable (MDS) Codes, Bound on Minimum Distance, Space Time Block Codes.

(10L)

Module IV

Cyclic Codes- Introduction to the Cyclic Codes, Polynomials, The Division Algorithm for Polynomials ,A Method for Generating Cyclic Codes, Matrix Description of Cyclic Codes, Burst Error Correction , Fire Codes, Golay Codes, Cyclic Redundancy Check(CRC) Codes, Circuit Implementation of Cyclic Codes. (6L)

Module V

Bose –Chaudhuri Hocquenghem(BCH)Codes- introduction to the Codes , Primitive Elements, Minimal Polynomials, Generator Polynomials , in Terms of Minimal Polynomials, Some Examples if BCH Codes, Reed –Solomon Codes, Implementation of Reed –Solomon Encoders and Decoders, Performance of RS Codes Over Real Channels, Nested Codes.

Module VI

Convolution Codes-Introduction to the Convolution Codes, Tree Codes and Trellis Codes, Polynomial Description of Convolution Codes(Analytical Representation), Distance Notions for Convolution Codes, The Generating Function, Matrix Description of Convolution Codes, Viterbi Decoding and Convolution Codes , Distance Bounds for Convolution Codes , Turbo Codes.

Trellis Coded ModulatioN- Introduction to TCM , The concept of Coded Modulation , Mapping by Set partitioning.

(8L)

Text book:

Bose R., "Information theory Coding and Cryptography", 2nd Edition, McGraw-Hill, 2008. (T1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	3	3	2	1	1	1	1	1	1	1	1	3	1	1	1
2	3	2	1	1	1	1	1	1	1	1	1	2	1	2	1
3	3	2	2	1	1	1	1	1	1	1	1	2	2	2	2
4	2	3	2	2	1	1	1	1	1	1	1	1	1	2	1
5	2	2	2	3	3	2	1	1	1	1	1	1	1	2	3

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS 341
Course title: **Optimization Technique**
Pre-requisite(s): Design and Analysis of Algorithm
Co- requisite(s): None
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B.Tech
Semester / Level: V
Branch: CSE/IT

Course Objectives

This course enables the students:

1.	To understand the basic idea of Network Optimization Models.
2.	To introduce the basic concept of Dynamic Programming.
3.	To understand the idea of Nonlinear Programming.
4.	To know about the basic concepts of Heuristic Programming.
5.	Provide the students to practice on Linear Programming for Problem solving.

Course Outcomes

After the completion of this course, students will be able to :

1.	Prepare the operational models for the real-world applications using Linear Programming
2.	Apply the techniques to solve the Network Optimization models
3.	Analyse the computational feasibility of the solutions using the Deterministic and Probabilistic Dynamic Programming
4.	Model problems using Non-Linear Programming and evaluate the suitability of the available techniques for the problem at hand
5	Apply the meta-heuristic algorithms for real world optimization

Syllabus

Module I

Introduction to Linear Programming,Solving Linear Programming Problems –Graphical Method,The Simplex Method,The Revised Simplex Method, Duality Theory , Dual Simplex Method, Sensitivity Analysis. (8L)

Module II

Integer Programming,Gomory's Cutting Plane Method, The Branch-and-Bound Technique for Binary and Mixed-Integer programming.Network Optimization Models, The Network Simplex Method. (8L)

Module III

Dynamic Programming: Characteristics of Dynamic Programming Problem,Deterministic Dynamic Programming, Probabilistic Dynamic Programming. (8L)

Module IV

Nonlinear Programming: Graphical Illustration of Nonlinear Programming Problems, Types of Nonlinear Programming Problems, Unconstrained Optimization, The Karush-Kuhn-Tucker (KKT) Conditions for Constrained Optimization, Quadratic Programming, Separable Programming, Convex Programming. (8L)

Module V

Queueing Theory : Basic Structure of Queueing Models, Examples of Real Queueing Systems, Role of Exponential Distribution, The Birth-and-Death Process,Different Queuing Models.

Heuristic Programming and Metaheuristics: The Nature of Meta-Heuristics, Search, Simulated Annealing, Genetic Algorithms. (8L)

Text Book:

Hiller ,S. & Lieberman ,G.J.,"Operations Research", 9/e , TMH, New Delhi–2012.(T1)

Reference Books:

Taha ,H.A.,"Operations Research", 9/e , Pearson Education , New Delhi-2013.(R1)
Pai,P.P.,"Operations Research", 1/e, Oxford University Press 2012.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment

Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	3	3	3	2	1	1	2	2	1	2	3	2	3
CO2	3	3	3	3	3	2	1	1	2	2	1	2	3	3	3
CO3	3	3	2	3	3	3	1	1	2	2	1	2	3	2	3
CO4	3	3	3	3	3	2	1	1	2	2	1	2	3	3	3
CO5	3	3	3	3	3	2	1	1	3	3	1	2	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT 347
Course title: Introduction to Distributed System
Pre-requisite(s):
Co- requisite(s): None
Credits: L: 0 T: 0 P: 0
Class schedule per week: 3
Class: B.Tech
Semester / Level: V
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Identifying trends in distributed systems
2.	Introducing peer to peer services and distributed file systems
3.	Understanding the issues in process and resource management
4.	Understanding the requirements for designing and supporting distributed systems

Course Outcomes
After the completion of this course, students will be able to:

1.	Define distributed systems and their architecture.
2.	outline peer to peer services and distributed file systems
3.	Elaborate on concepts of process and resource management
4.	Analyze the requirements for designing and supporting distributed systems
5.	Discuss and design the working of distributed systems

Syllabus
Module I
Introduction: Introduction to “Large-Scale”distributed systems, Consequences of “large-scale” Some large-scale distributed systems, Architectures of large scale distributed systems. (8L)

Module II
Design principles of Distributed system: Introduction to peer-to-peer systems, The peer-to-peer paradigms, Services on structured overlays, Building trust in P2P systems. (8L)

Module III
Communication in Distributed system: System Model – Inter Process Communication – the API for internet protocols – External data representation and Multicast communication.

Peer to Peer Services: Peer-to-peer Systems - Introduction - Napster and its legacy - Peer-to-peer - Middleware - Routing overlays.
File System: Features-File model -File accessing models- File sharing semantics
Naming: Identifiers, Addresses, Name Resolution - Name Space Implementation - Name Caches - LDAP. (8L)
Module IV
Remote Method Invocation and Objects: Remote Invocation - Introduction - Request-reply protocols - Remote procedure call - Remote method invocation.

Case study: Java RMI – Group communication - Publish-subscribe systems - Message queues - Shared memory approaches -Distributed objects - Case study: Enterprise Java Beans -from objects to components. (8L)
Module V
Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation.
Resource Management: Introduction- Features of Scheduling Algorithms -Task Assignment Approach - Load Balancing Approach - Load Sharing Approach. (8L)

Text Books:

Coulouris G., Dollimore J., and Kindberg T., “Distributed Systems Concepts and Design”, 5th Edition, Pearson Education, 2012.(T1)
Distributed Systems: Design and Algorithms, Editors(s):SergeHaddadFabriceKordonLaurentPautetLaure Petrucci, Wiley online Library.(T2)

Reference Books:

A. S. Tanenbaum, M. Van Steen, “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.(R1)
P. K. Sinha, “Distributed Systems: Concepts and Design”, Prentice Hall, 2007.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	2	2	2	2	1	2	1	1	2	1	3	3	2	2
CO2	3	2	2	2	2	1	2	1	2	2	1	3	3	2	2
CO3	3	2	3	3	2	2	2	2	2	2	3	3	3	3	3
CO4	3	2	3	2	3	2	2	2	2	3	2	3	3	2	3
CO5	3	2	3	3	3	1	2	2	2	3	3	3	3	3	3

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT 349
Course title: Cryptography & Network Security
Pre-requisite(s):
Co- requisite(s): None
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B.Tech
Semester / Level: V
Branch: CSE/IT

Course Objectives

1.	To Learn Basic Concepts of Cryptography and Network Security and Apply them in various Real life Application.
2.	To understand the basic concepts of Network Security
3.	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
4.	To understand how to deploy encryption techniques to secure data in transit across data networks
5.	To design security applications in the field of Information technology

Course Outcomes

After the completion of this course, students will be:

1.	Understand the basic concept of Cryptography and Network Security and their mathematical models, and to be familiar with different types of threats
2.	Learning and applying various Ciphering Techniques.
3.	Apply Symmetric and Asymmetric Cryptographic Algorithms and Standards in Networks.
4.	Examine the issues and structure of Authentication Service and Electronic Mail Security
5.	To explain and classify different malicious programs, worms and viruses, and to learn the working and design principles of Firewalls

Syllabus

Module I

Introduction to Cryptography: ComputerSecurity concepts, The OSI Security Architecture, Security Attacks, Security Services, A model for Network Security, Classical Encryption Techniques. (8L)

Module II

Mathematical Foundations of Cryptography: Modular Arithmetic, Euclidean Algorithm, Groups, Rings, Fields, Finite Fields of the Form GF(p), Polynomial Arithmetic, Finite Fields of the Form GF(2^n), Prime Numbers, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Quadratic Congruence, Discrete Logarithms. (8L)

Module III

Symmetric and Asymmetric Cryptography: Difference Between Symmetric and Asymmetric Cryptography, DES, Triple DES, AES, RSA Cryptosystem, Symmetric and Asymmetric Key Cryptography Together, Elgamal Cryptosystem, Elliptic Curve Cryptosystems, , Diffie-Hellman Key Exchange , Cryptographic Hash Functions, Message Authentication Codes, Digital Signature. (8L)

Module IV

Internet Security Protocols : Basic Concepts, Security Socket Layer (SSL), Secure Hyper Text Transfer Protocol (SHTTP), Time stamping Protocol(TSP), Secure Electronic Transaction(SET), SSL Versus SET, 3-D Secure Protocol, Electronic Money, Email Security, Wireless Application Protocol(WAP) Security, Security in GSM. (8L)

Module V

Network Security: Users, Trusts and Trusted Systems, Buffer Overflow and Malicious Software, Malicious Programs, Worms, Viruses, Intrusion Detection Systems (IDS), Firewalls: Definitions, Constructions and Working Principles. (8L)

Text Book:

Forouzan B. A., Mukhopadhyay D., "Cryptography and Network Security", 3rd Edition, Mcgraw Higher Education, 2016. (T1)

Reference Books:

Stallings W., "Cryptography and Network Security: Principles and Practice", 7th Edition, Pearson, 2017.(R1)

Kahate A., "Crptography and Network Security", 3rd Edition, McGraw Hill Education, New Delhi, 2013.(R2)

Schneier B., "Applied Cryptogaphy: Protocols, Algorithms And Source Code In C", 2nd Edition, Wiley, 2007. (R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors

CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcome onto Program Outcome

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	3	3	3	2	2	1	2	2	2	3	1
CO2	3	3	3	3	3	3	3	2	2	2	1	2	1	2	3
CO3	3	2	3	3	3	2	2	2	2	2	2	2	2	3	3
CO4	3	2	3	3	2	2	1	2	2	2	2	2	1	2	3
CO5	3	2	3	3	1	2	2	2	2	1	1	2	2	1	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

PROGRAMME ELECTIVE -II

COURSE INFORMATION SHEET

Course code: CS331
Course title: **Formal language and Automata Theory**
Pre-requisite(s): Discrete Mathematics
Co- requisite(s): NIL
Credits: L:3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: V
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Define a system and recognize the behavior of a system.
2.	Design finite state machines and the equivalent regular expressions.
3.	Construct pushdown automata and the equivalent context free grammars
4.	Design Turing machines and Post machines
5.	Learn about the issues in finite representations for languages and machines, as well as gain a more formal understanding of algorithms and procedures.

Course Outcomes
After the completion of this course, students will be able to:

1.	Relate formal languages and mathematical models of computation
2.	Analyze different types of languages and the corresponding machines
3.	Analyze the Pushdown machine and its role in compiler construction
4.	Find the capability of real computers and learn examples of unsolvable problems.
5.	Analyze classes of P, NP, NP-C and NP-Hard problems

Syllabus

Module I

Introduction to Automata: (mathematical model of digital devices, including real computer), State Transition Graph, Finite Automaton (FA) and its types, Deterministic Finite Automaton (DFA), Non-deterministic Finite Automaton (NDFA), Complement, Union, Intersection of FA's , Conversion Strategy from NDFA to DFA , Minimization of FA, Finite Automaton with Output, Applications of FA. (10L)

Module II

Regular Expressions(RE): Introduction , R.E.'s and basic operations, Algebraic laws on Regular Expression, Finite and Infinite Languages, Equivalence of finite Automaton and regular expressions, Constructing NDFA from Regular Expression , Pumping Lemma for Regular Language, Closure properties of Regular Languages, Non-regular languages, Applications of Regular Expression. (6L)

Module III

Grammar: Introduction, Formal Definition of Grammar, The Chomsky Hierarchy of Grammar, Designing Regular grammar from DFA, Context Free Grammar, Closure properties of Context Free Languages, , CFG and Normal form: Chomsky Normal Form, Greibach Normal Form, Non-Context Free Language, Applications of CFGs. (8L)

Module IV

Push Down Automation (PDA): Introduction, Definition of PDA, Types of Pushdown Automata (DPDA and NPDA), Converting CFG to PDA, Derivation (Parsing), Parsing Techniques, Ambiguous and Unambiguous Grammar, Demerits of Ambiguous Grammar. (8L)

Module V

Turing Machine(TM): Single Tape TM, Variations of TM, Halting Problem, Turing Machine and Languages, Enumerable Languages, Decidable, Recognizable and Undecidable languages, Solvable and Unsolvable problems, Post Correspondence Problems(PCP), Classes of Problems: P, NP, NP-C and NP-Hard. (8L)

Text Book:

Hopcroft J.E., Motwani R. and Ullman J.D, Introduction to Automata Theory, Languages and Computations, Second Edition, Pearson Education, 2008. (T1)

Reference Books:

Mishra K.L.P. andChandrasekaran N. , Theory of Computer Science: Automata, Languages and Computation, 3rd Edition, PHI.(R1)

Martin John C., Introduction to Languages and the Theory of Computation, 3rd Edition, TataMcGraw Hill Publishing Company, New Delhi, 2007. (R2)

Lewis Harry R. and Papadimitriou Christos H., Elements of the theory of Computation, 2nd Edition, Prentice-Hall of India Pvt. Ltd. (R3)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets

CD7	Simulation

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	3	2	3	3	1	2	1	1	2	1	1	1	3	3	2
2	3	3	1	3	1	2	2	1	1	1	2	1	2	2	1
3	3	3	3	3	3	1	1	1	2	2	1	2	2	3	1
4	3	1	2	1	2	1	2	2	1	1	1	2	2	3	1
5	2	2	1	2	3	1	1	1	1	3	2	3	2	2	1

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT 351
Course title: **Natural Language Processing**
Pre-requisite(s): CS305 Compiler Design
Co- requisite(s): NIL
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: V
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the basic component of Natural Language Processing.
2.	To explore the application areas of Natural Language Processing.
3.	To understand the idea of Language Modelling.
4.	To explore the basic concepts of Parts-of-speech Tagging.
5.	To understand the concepts of language modelling.

Course Outcomes
After the completion of this course, students will be able to:

1.	Describe the typical NLP problem, their importance & difficulty; and concepts of morphology, syntax, semantics, discourse & pragmatics of natural language.
2.	Demonstrate understanding of the relationship between NLP and statistics& machine learning.
3.	Discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis.
4.	Analyse NLP problems to decompose them into appropriate components.
5.	Evaluate a NLP system, identify shortcomings and suggest solutions for these shortcomings.

Syllabus

Module I

Introduction to NLP :introduction and applications, NLP phases, Difficulty of NLP including ambiguity; Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of English. (8L)

Module II

Language Modelling: N-gram and NeuralLanguageModelsLanguage Modelling with N-gram, Simple N-gram models, Smoothing(basic techniques), Evaluating language models;Neural Network basics, Training;Neural Language Model, Case study: application of neural language model in NLP system development**.** (8L)

Module III

Parts-of-speech Tagging**: basic concepts; Tagset; Early approaches: Rule based and TBL; POS tagging using HMM, POS Tagging using Maximum Entropy Model.** (8L)

Module IV

ParsingBasic concepts: top down and bottom up parsing, Treebank; Syntactic parsing: CKY parsing; Statistical parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs. (8L)

Module V

Semantics: Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embeddings from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WorldNet. (8L)

Text books:

Jurafsky Dan and Martin James H., Speech and Language Processing **(3rd ed.)***To be published in 2018*. Available at: https://web.stanford.edu/~jurafsky/slp3/. (T1)

Reference books:

Jurafsky D. and Martin J. H., Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.(R1)

Goldberg Yoav, A Primer on Neural Network Models for Natural Language Processing.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	2	2	2	1	1	1	2	1	3	1	1	3	2	1
CO2	3	3	3	1	3	1	1	1	3	1	2	2	3	2	1
CO3	3	3	3	3	3	1	2	2	2	1	1	2	3	3	2

CO4	3	3	3	1	3	2	1	1	2	1	1	2	3	3	2
CO5	3	3	3	3	3	1	1	1	1	1	1	2	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS 343
Course title: SYSTEM PROGRAMMING
Pre-requisite(s): Nil
Co- requisite(s):NIL
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B.Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Describe the utility of different system softwares & system tools.
2.	Familiarize with the trade-offs between run-time and compile-time processing (Linking & Loading techniques).
3.	To learn the concepts and techniques behind the designing of various system software.
4.	To organize the functionalities & components of system software & tools into different layers for efficient code generation.

Course Outcomes
After the completion of this course, students will be able to:

1.	Understand the evolution of various system software.
2.	Apply various data structures that helps in the proper functioning of the system programs.
3.	Differentiate and analyze the design aspects of different text editors, debuggers etc.
4.	Design various translators and other system software’s.
5.	Implement various translators and other system software’s.

Syllabus

Module I

Introduction: System Software & its Components, System Software and Machine Architecture, Traditional (CISC) machines, RISC Machines, Inputs and processing steps on language translators Evolution of System Softwares- Operating System, Loaders, Interpreters, Compilers, Linkers, Assemblers

Module II:

Assemblers: Elements of Assembly Language Programming, Assembly Process, Single Pass Assembler, Design of a 2-Pass assembler, Implementation Examples. (8L)

Module III

Loaders: Basic Loader Functions, Absolute Loader, Compile & go Loader, Relocating Loader, Direct Linking Loader. (8L)

Module IV

Macros & Macro processors: Macros, Different forms of Macros, Macros using AIF, AGO, REPT. Etc, Design of a Macro Processor, Macro Assembler. (8L)

Module V

Linkage Editors: Linking and Relocation, Program Reliability, Linkage Editor and its Application in IBM-PC, Linking for Program Overlay, **Software Tools:** Spectrum of Software Tools, Text Editors, Interpreter and Program Generators, Debug Monitors, Programming Environments. (8L)

Text Book:

Dhamdhere D.M., "System Programming and Operating Systems", 2nd Edition., TMH, New Delhi.(T1)

Reference Book:

Donovon J.J., " System Programming", TMH, New Delhi.(R1)
Beck Leland L., "System Software – An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2000. (R2)
Chattopadhyay Santanu, "System Software", Prentice-Hall India, 2007. (R3)

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u><u>N/A</u>

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects

CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	2	3	3	1	1	2	2	1	3	3	2	1
CO2	3	3	2	3	3	2	1	1	2	2	2	1	3	2	2
CO3	3	3	2	3	2	3	1	2	2	2	2	1	3	2	3
CO4	3	2	3	2	3	3	1	2	2	3	3	1	3	3	3
CO5	3	3	3	3	2	2	2	2	2	1	2	1	3	1	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course Code: IT353
Course Title: Blockchain Technology
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P:0
Class schedule per week: 3
Class: B.Tech
Semester / Level: PE
Branch: CSE/IT

Course Objectives

This course enables the students:

1.	To provide an overview of the different blockchain technologies.
2.	To provide the knowledge on the need of blockchain and its applicability in real world problem.
3.	To provide the knowledge of cryptocurrency design and its security against scam ,fraud, hacking.
4.	To provide the ability to design and implement new ways of using blockchain for applications other than cryptocurrency.
5.	To be able to apply the knowledge gained through the course in actual blockchain development or blockchain contract developer

Course Outcomes

After the completion of this course, students will be able to:

1.	Learn and explain the difference between centralized, decentralized network and blockchain.
2.	Explain fundamental concepts of blockchain using hashes and consensus.
3.	Understand the concept of mining in blockchains.
4.	Understand the working of Bitcoin and its security.
5.	Know about the different platforms for implementing blockchain and its varied application.

Syllabus

Module I

Introduction to Blockchain Technology

Introduction to Blockchain, Trusted Third party for transactions, Difference between centralized, decentralized and distributed peer to peer networks, Types of Blockchain (Permission Blockchain vs. Permissionless Blockchain), History of Bitcoins.

Module II

Fundamental concepts of Blockchain

Concepts of Block, Transactions, Hashes, Consensus. Hashes: Hash cryptography, Encryption vs. hashing, Transactions: Recording transactions, Digital Signature, Verifying and confirming transactions, Blocks and blockchain: Hash pointers, Blocks, Consensus building. Distributed consensus, Byzantine generals problem, Consensus mechanism: POW, POS, POB, POA, etc. Blockchain Architecture, Markle Root Tree.

Module III

Mining and simulating blockchain

Mining and simulating blockchain: Game theory behind competitive mining. Incentives: mining and transaction fees, Energy expended in mining.

Module IV

Bitcoin ad Security

Bitcoin: Bitcoin creation, exchanges. Wallets, security. Protecting blockchain from attackers. Forks – soft and hard, Blockchain security, Key Management in Bitcoin, Case studies.

Module V

Platforms and Applications

Introduction to Blockchain platform: Ethereum, Hyperledger, IOTA, EOS, Multichain, SOLIDITY, Designing a new blockchain, Distributed Application (DAPP).
Applications: E-Governance, Elections, File sharing, Micropayments
Challenges and Research Issues in blockchain

Text Book:

1. Bitcoin and Cryptocurrency technologies: a comprehensive introduction. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Princeton University Press, First edition,2016
2. Blockchain Applications: A Hands-On Approach. Arshdeep Bahga, Vijay Madisetti. VPT Publisher. First edition,2018.
3. Blockchain: Step – by – Step Guide to Understand by Paul Laurence, Createspace Independent Pub.

Reference Book:

1. Introducing Ethereum and Solidity Foundations of Cryptocurrency and Blockchain Programming for Beginners by Chris Dannen, Apress
2. Blockchain: The comprehensive beginner's guide by Frank Walrtin

Web References:

1. https://bitcoin.org/bitcoin.pdf
2. https://blockchain.mit.edu/how-blockchain-works

Gaps in the syllabus (to meet Industry/Profession requirements): NA

POs met through Gaps in the Syllabus: NA

Topics beyond syllabus/Advanced topics/Design: NA

POs met through Topics beyond syllabus/Advanced topics/Design: NA

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2*10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Mini Project
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

	Program Outcomes (POs)												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	2	3	1	2	1	2	2	3	2	3	2	1
CO2	3	3	3	2	2	1	1	1	1	2	2	2	3	3	2
CO3	3	3	3	3	2	1	1	1	1	1	1	1	3	3	2
CO4	3	2	2	2	1	1	1	1	2	2	3	2	2	2	1
CO5	3	3	3	3	2	2	1	1	2	2	2	2	3	3	3

Mapping Between Course Outcomes And Course Delivery Method

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD6
CO2	CD1, CD2, CD6
CO3	CD1, CD2, CD6, CD7
CO4	CD1, CD3, CD6
CO5	CD1, CD2, CD3, CD4, CD5, CD6, CD7

PROGRAMME ELECTIVE -III

COURSE INFORMATION SHEET

Course code: IT355
Course title: **Wireless Sensor Networks**
Pre-requisite(s): IT301 Data Communication and Computer Networks
Co-requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: VI
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Familiarize with the principles of sensor nodes, network deployment and architectures.
2.	Know the data transmission and routing protocols. Know the differences among different networks.
3.	Analyze or compare the performance of different routing and MAC protocol
4.	Evaluate the performance of different MAC protocols and clustering algorithm
5.	Compute the throughput and channel utilization for different network scenarios.

Course Outcomes
After the completion of this course, students will be:

1.	Obtain a broad understanding about the network architecture of wireless sensor network.
2.	Understand all basic characteristics of wireless sensor networks and sensor nodes.
3.	Understand the principles of data transmission, clustering algorithm and routing protocols.
4.	Analyse and evaluate different constraint of wireless sensor network, e.g., coverage, powermanagement, security and data collisions.
5.	Design and development of new sensor network architecture.

SYLLABUS

Module I

Introduction: Wireless channel and communication fundamentals, Features of Wireless sensor network, Design principles for WSNs, Service interfaces of WSNs and Gateways, Applications, Hardware components, Sensor deployment mechanism. (6L)

Module II

Network and Component Technologies: Topologies and characteristics, Sensor network characteristics, energy consumption model, Power management, Localization, hierarchical and cluster based topology control. (10L)

Module III

Data Transmission and Routing: Data processing and aggregation, Data storage, Network clustering protocols, Multi-hop communication protocols, Energy efficient routing, Data aggregation and data centric routing. (8L)

Module IV

Protocols: MAC Protocols, Framing and error control in WSNs, Medium access control protocols, Congestion control and rate control protocols. (8L)

Module V

QOS Issues:

Coverage and deployment, Reliable data transport, Single packet and block delivery, Congestion control and rate control, Collisions, Collision avoidance mechanism. (8L)

Text books:

Karl Holger and Willig Andreas, "Protocols and Architectures for Wireless Sensor Networks".(T1)

Callaway Jr. Edgar H. and Callaway Edgar H., "Wireless Sensor Networks: Architectures and Protocols".(T2)

Reference books:

Zhang Yan, Jejunum, Hu Honglin, "Wireless Mesh Networking, Architecture, Protocols and Standards".(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	3	3	3	3	1	2	3	1	2	2	3	3	3
CO2	3	2	2	3	3	2	1	1	2	2	2	1	3	2	2
CO3	3	3	2	3	3	3	3	2	2	2	2	1	3	1	2
CO4	3	2	3	2	3	2	1	2	2	3	3	1	3	3	2
CO5	3	3	3	3	2	2	2	2	2	1	2	1	2	2	3

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS349
Course title: **Simulation and Modelling**
Pre-requisite(s): CS201 Data Structure
Co- requisite(s):
Credits: L: 3 T:0 P:0
Class schedule per week: 4
Class: B. Tech
Semester / Level: VI
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To Characterise engineering systems in terms of their essential elements, purpose, parameters, constraints, performance requirements, sub-systems, interconnections and environmental context.
2.	To understand Engineering problem modelling and solving through the relationship between theoretical and mathematical
3.	To provide Mathematical modelling real world situations related to engineering systems development.
4.	To able Generate random numbers and random varieties using different techniques.
5.	To provide the knowledge of queuing theory to solve real life problem

Course Outcomes
After the completion of this course, students will be able to do the following:

1.	Define basic concepts in modeling and simulation (M&S)
2.	Classify various simulation models and give practical examples for each category
3.	Analyze the behavior of a dynamic system and create an analogous model for a dynamic system.
4.	Analyze and test random number variates and apply them to develop simulation models
5.	Develop a real-life model using queuing system

Syllabus
Module I

The concepts of a system, System Environment, Stochastic Activities, continuous and discrete systems, System Modeling, Types of models.System Studies: Subsystem, A Corporate Model, Environment segment, Production Segment, Management Segment, full Corporate Model, Types of System study, System Analysis, System Design, System Postulation. (7L)

Module II

The technique of simulation, the Monte Carlo method, comparison of simulation and analytical methods, experimental nature of simulation, types of system simulation, numerical computation technique for continuous & discrete models, distributed lag models, cobweb models. Continuous system models, differential equations, analog computers & methods, hybrid computers, CSSLs, CSMP-III, Feedback Systems, Simulation of an Autopilot. (8L)

Module III

Exponential Growth & decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamics diagrams, Simple system dynamics diagrams, multi–segment models, representation of time delays. (8L)

Module IV

Evaluation of continuous probability functions, continuous uniformly distributed random numbers, a uniform random number numbers, generating discrete distributions, non-uniform continuously distributed random numbers, the rejection method. Random numbers Generators: Techniques for generating random numbers. Test for random numbers. Random vitiate Generation: Inverse transform technique, exponential distribution, uniform distribution. (8L)

Module V

Queuing disciplines, measures of queues. Discrete events, representation of time, generation of arrival patterns, simulation of a telephone system, delayed calls, Simulation programming tasks, measuring utilization and occupancy. (9L)

Text books:

Gordon Geoffrey, System Simulation, 2nd Edition, Pearson Education, 2007. (T1)
Banks J., Carson J. S. , Nelson B.L., Nicol D.M., Discrete-Event System Simulation, 4thEdn, Pearson Education, 2007. (T2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	2	2	2	2	1	1	1	2	1	2	2	2	2
CO2	3	3	3	2	3	2	2	1	1	2	1	2	3	2	2
CO3	3	3	3	3	3	2	2	1	1	2	1	2	3	3	2
CO4	3	3	3	3	3	2	2	1	1	2	1	2	3	3	3
CO5	3	3	3	2	3	2	2	1	1	2	1	2	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS350
Course title: **Simulation and Modelling Lab**
Pre-requisite(s): CS322 Simulation Modelling
Co- requisite(s):NIL
Credits: L: 0 T:0 P:3
Class schedule per week: 3
Class: B. Tech
Semester / Level: VI
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To Characterise engineering systems in terms of their essential elements, purpose, parameters, constraints, performance requirements, sub-systems, interconnections and environmental context.
2.	To understand Engineering problem modelling and solving through the relationship between theoretical and mathematical
3.	To provide Mathematical modelling real world situations related to engineering systems development.
4.	To able Generate random numbers and random varieties using different techniques.
5.	To provide the knowledge of queuing theory to solve real life problem

Course Outcomes
After the completion of this course, students will be able to do the following:

1.	Define basic concepts in modeling and simulation (M&S)
2.	Classify various simulation models and give practical examples for each category
3.	Analyze the behavior of a dynamic system and create an analogous model for a dynamic system.
4.	Analyze and test random number variates and apply them to develop simulation models
5.	Develop a real life model using queuing system

Syllabus

1. Computer Generation of Random Numbers
2. Chi-square goodness-of-fit test.
3. One-sample Kolmogorov-Smirnov test
4. Test for Standard Normal Distribution
5. Testing Random Number Generators.
6. Monte-Carlo Simulation.
7. Simulation of Single Server Queuing System.
8. Simulation of Two-Server Queuing System.
9. Simulate and control a conveyor belt system
10. Two-sample Kolmogorov-Smirnov test.

Text books:

Gordon Geoffrey, System Simulation, 2nd Edition, Pearson Education, 2007. (T1)
Banks J., Carson J. S. , Nelson B.L., Nicol D.M., Discrete-Event System Simulation, 4thEdn, Pearson Education, 2007. (T2)

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	2	2	2	2	1	1	1	2	1	2	2	2	2
CO2	3	3	3	2	3	2	2	1	1	2	1	2	3	2	2
CO3	3	3	3	3	3	2	2	1	1	2	1	2	3	3	2
CO4	3	3	3	3	3	2	2	1	1	2	1	2	3	3	3
CO5	3	3	3	2	3	2	2	1	1	2	1	2	3	3	3

COURSE INFORMATION SHEET

Course code: IT357
Course title: **Pattern Recognition**
Pre-requisite(s):
Co- requisite(s): NIL
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: VI
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Be familiar with both the theoretical and practical aspects Pattern Recognition.
2.	Have described the foundation of pattern formation, measurement, and analysis.
3.	Understand the mathematical and computer aspects of while extracting features of an object.
4.	Learn the techniques of clustering and classification for various applications.

Course Outcomes

After the completion of this course, students will be able to

1.	Apply their knowledge on Real World Problems while converting these problems to computercompatible problems for Pattern Recognition.
2.	Solve Decision making model using Statistical and Mathematical Decision Theory.
3.	Design clusters for various Pattern using classical and Modern clustering techniques.
4.	Analyzing various Techniques for Pattern Classification and Clustering.
5.	Develop Model for Pattern classification through Probabilistic or fuzzy.

Syllabus

Module I
Introduction: Feature Vectors, Classifiers, Supervised, Unsupervised, MATLAB Tools. Classifiers Based on Bayesian Theory, Linear Classifiers, Nonlinear Classifiers. (10L)

Module II
Feature Selection, Feature Generation I: Data Transformation and Dimensionality Reduction, Feature Generation II. (10L)

Module III
Template Matching, Context Dependent Classification, Supervised Learning. (10L)

Module IV
Clustering: Basic Concepts, sequential Algorithms. (5L)

Module V
Hierarchical algorithms, Fuzzy clustering, probabilistic clustering, Hard Clustering, Optimization. (5L)

Text Books:

Theodoridis S., Koutroumbas K., Elsevier, "Pattern Recognition", 5th Edition 2015.(T1)
Murty N. Narshima "Pattern Recognition", Springer, University Press2nd edition,2015.(T2)

Reference Book:

DudaR.O.,Hart E. Peter,Stork G. David," Pattern Classification" 2nd Edition, John Wiley, New York, 2002.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure **Direct Assessment**

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	2	3	2	1	1	2	1	2	2	3	2	3
CO2	3	2	2	3	3	2	1	1	2	2	2	1	3	2	2
CO3	3	2	2	3	2	3	3	2	2	2	2	1	3	1	2
CO4	3	2	3	2	3	2	1	2	2	3	3	1	3	3	2
CO5	3	3	3	3	2	2	2	2	2	1	2	1	2	2	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT58
Course title: **Pattern Recognition Lab**
Pre-requisite(s): IT328 Pattern Recognition
Co- requisite(s): NIL
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: VI
Branch: CSE/IT

Course Objectives

This course enables the students:

1.	Apply their knowledge on Real World Problems while converting these problems to computercompatible problems for Pattern Recognition.
2.	Solve Decision making model using Statistical and Mathematical Decision Theory.
3.	Design clusters for various Pattern using classical and Modern clustering techniques.
4.	Analyzing various Techniques for Pattern Classification and Clustering.
5.	Develop Model for Pattern classification through Probabilistic or fuzzy.

Course Outcomes

After the completion of this course, students will be able to:

1.	formulate and describe various applications in pattern recognition
2.	understand the Bayesian approach to pattern recognition
3.	Be able to mathematically derive, construct, and utilize various classifiers both theoretically and practically
4.	be able to identify the strengths and weaknesses of different types of classifiers
5.	validate and assess different clustering techniques

Syllabus

1. Implement a function for extracting the colour histogram of an image.
2. Read all the images from the training set. For each image compute the colour histogramwith general bin size *m* and save it as a row in the feature matrix ***X***. Save the corresponding class label in the label vector ***y*.**
3. Implement the k-NN classifier for an unknown image and for a general *K* value.
4. Evaluate the classifier on the test set by calculating the confusion matrix and the overallaccuracy.
5. Try out different values for the number of bins for the histogram and the parameter *K* tosee which feature attains the best performance.
6. Convert the input image into Luv or HSV colour-space before histogram calculation.

Text books:

4. Pattern Recognition and Machine Learning, Christopher Bishop, Springer 2006.

Reference books:

5. Introduction to Statistical Learning, Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer, 2013.
6. Pattern Classification, 2nd Ed., Richard Duda, Peter Hart, David Stork, John Wiley & Sons, 2001.

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	3	3	1	3	2	2	2	1	2	3	3	2
CO2	3	2	3	1	2	1	2	3	2	1	1	2	2	3	2
CO3	3	3	3	1	2	1	2	3	1	2	1	2	3	2	2
CO4	3	3	3	1	2	2	2	2	1	2	3	2	3	1	2
CO5	3	2	3	1	2	2	1	3	2	2	3	2	3	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CS431
Course title: **Computer Graphics**
Pre-requisite(s): CS206 Design and Analysis of Algorithm
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: VI
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	To understand different hardware used for graphical requirement
2.	To perform visual computations for geometrical drawings.
3.	To display 3D objects in a 2D display devices using projection techniques
4.	To model 3D
5.	To create realistic images using color and shading techniques

Course Outcomes
After the completion of this course, students will be:

1.	Able to understand different hardware used for graphical requirement.
2.	Able to perform visual computations for geometrical drawings.
3.	Able to display 3D objects in a 2D display devices using projection techniques
4.	Able to model 3D objects
5.	Able to create realistic images using color and shading techniques

Syllabus
Module I
Introduction and Overview of Graphics Systems

Use of Computer graphics, Video Display Devices, Raster and Random Scan Displays, Colour CRT Monitors, Flat Panel Displays, Three-Dimensional Viewing Devices, Stereoscopic & Virtual Reality, Graphics system architecture, Input Devices, Graphics Software.

Output Primitives
Points and Lines, Line Drawing Algorithms (DDA &Bradenham's), Circle and Ellipse Generating Algorithms, Conic Sections. Filling Polygons, Pattern Filling, Thick Primitives, Line Style and Pen Style, Generating Characters, Aliasing and Antialiasing. (7L)

Module II
Geometric Transformations

Two dimensional transformations and their matrix representations, Translation, Rotation, Scaling, Reflection, Shears, Homogeneous Coordinates, Composite Transformations, transformations between Coordinate Systems, Affine transformations, 2-Dimensional viewing pipeline, Window-to-Viewport Coordinate transformation, Clipping-Point, Line clipping-Cohen Sutherland, Liang Bursky, Polygon clipping – Sutherland Hodgeman, weilerArtherton, Curve and Text Clipping, Three Dimensional Transformations, Translation, Rotation, Scaling, Reflection, Shears. (8L)

Module III
Three Dimensional Concepts and Object Representation

Three Dimensional Display Methods, Polygon Surfaces, Curved Lines & Surfaces, Quadric Surfaces, Spline Representations, Cubic Spline interpolation methods, Hermite Interpolation, Bezier Curves and Surfaces, Properties of B-splines, Fractal.

Three Dimensional Transformations and Viewing

Three dimensional viewing pipe line, Projections- Parallel and Perspective, Projection Transformations, Clipping. (7L)

Module IV
Color Model and Color application

Properties of light, Standard primaries and chromaticity diagram, XYZ Color model, RGB color model. YIQ color model, HSV color model, HLS color model

Illumination Model and Surface Rendering

Light sources, Basic Illumination Models, Ambient light, Defuse and specular reflection. Shadows, Transparency, Assigning intensity levels, Polygon Rendering Methods, Constant intensity shading, Gourad shading, Phong shading, Detail. (7L)

Module V
Visible Surface Detection Methods

Classification of Visible Surface Detection Algorithms, Back Face Detection, Depth Buffer Method, A-Buffer Method, Scan-Line Method, Depth Sorting Method, BSP-Tree Method & Area Subdivision Method. Octrees, Ray casting method.

Graphical User Interfaces and Interactive Input Methods

The User Dialogues, Input of graphical data.

Computer Animation

Design of animation sequences, General computer animation functions, Raster animation, Computer animation languages, Key frame systems. (7L)

Text books:

Hearn D. & Baker M.P. , Computer Graphics, 2/e , Pearson Education, New Delhi, 2005.(T1)

Reference books:

Foley J.D. et. Al, A Fundamental of Computer Graphics, Addition Wesley, London, 1993.(R1)

Krishnamurthy N, Introduction to Computer Graphics, 1st Edn., TMH, 2002.(R2)

Rogers B., Mathematical elements of Computer Graphics, McGraw Hill, 1989.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	3	2	1	1	2	1	1	2	3	2	2
CO2	3	2	2	3	3	2	1	1	2	2	2	1	3	2	2
CO3	3	2	2	3	2	3	3	2	2	2	2	1	3	1	2
CO4	3	2	3	2	3	2	1	2	2	3	3	1	3	3	2
CO5	3	3	3	3	2	2	2	2	2	1	2	1	2	2	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS328
Course title: **Computer graphics lab**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level:VI
Branch: CSE/IT

Course Objectives
This course enables the students:

A.	Able to understand different hardware used for graphical requirement.
B.	Able to perform visual computations for geometrical drawings.
C.	Able to display 3D objects in a 2D display devices using projection techniques
D.	Able to create realistic images using color and shading techniques
E.	Able to model 3D objects

Course Outcomes
After the completion of this course, students will be able to:

1.	To list the basic concept used in Computer Graphics
2.	To describe the importance of viewing and projections.
3.	To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
4.	To design an application with the principles of Computer Graphics
5.	To define the fundamentals of animation, virtual reality and its related technologies.

<u>Syllabus</u>

1. Study of basic graphics functions defined in “graphics.h”.
2. Write a program to draw a line using Bresenham’s Algorithm
3. Write a program to draw a line using DDA Algorithm.
4. Write a program to draw a line using Mid-Point Algorithm.
5. Write a program to draw a Circle using Mid-Point Algorithm.
6. Write a program to draw a Ellipse using Mid-Point Algorithm.
7. Programs using 2-D transformations in C.
8. Implement Polygon filling algorithms [Flood-Fill Algorithm] in C.
9. Program for Cohen Sutherland Line clipping algorithm in C.
10. Write a program to implement reflection of a point, Line.
11. Write a program to rotate a circle around any arbitrary point or around the boundary ofanother circle.
12. Write a program to implement polygon filling.
13. Programs to study 3-D transformations in C.

Text books:

1. D. Hearn & M.P. Baker - Computer Graphics, 2/e , Pearson Education, New Delhi, 2005.

2. Prabat K Andleigh and KiranThakrar, “Multimedia Systems and Design”, PHI, 2005.

Reference books:

1. W.M. Newman. et. al.- Principle of Interactive Computer Graphics, McGraw Hill Publication,New Delhi, 1995.
2. S. Harrington -Computer Graphics- A Programming Approach, McGraw Hill Publication, NewDelhi, 1994.
3. J.D. Foley et. al- A Fundamental of Computer Graphics Addition Wesley, London, 1993.

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	3	2	1	2	1	2	2	1	2	3	3	2
CO2	3	3	3	2	2	1	2	1	1	1	2	2	2	3	3
CO3	3	2	2	2	3	2	2	2	2	2	3	2	3	3	3
CO4	3	3	3	2	3	2	2	1	2	1	1	1	2	2	1
CO5	2	3	3	2	3	3	3	3	3	2	3	3	3	3	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT445
Course title: **Internet of Things(IoT)**
Pre-requisite(s): IT201 Basics of Intelligent Computing
Co-requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: VII
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Understand the basic concept and the Iot Paradigm
2.	Know the state of art architecture for IoT applications
3.	Learn the available protocols used for IoT
4.	Design basic IoT Applications.
5.	Evaluate optimal IoT applications.

Course Outcomes
After the completion of this course, students will be:

1.	Identify the IoT Components and its capabilities
2.	Explain the architectural view of IoT under real world constraints
3.	Analyse the different Network and link layer protocols
4.	Evaluate and choose among the transport layer protocols
5.	Design an IoT application

Syllabus
Module I
Introduction to IOT

The definition of the Internet of Things, main assumptions and perspectives. Platform for IoT devices Device architectures. Conventional and renewable power sources for resource-constrained devices. Operating systems for resource-constrained devices. (8L)

Module II
Architecture of IOT
Node structure: Sensing, Processing, Communication, Powering IOT networking: Topologies, Layer/Stack architecture, The data link layer for IoT- Wireless communication technologies. Wire communication technologies. Manet Networks.
(8L)

Module III
Communication Technologies

Introduction to ZigBee, BLE, WiFi, LTE, IEEE 802.11ah, Discuss data rate, range, power, computations/bandwidth, QoS, Service oriented protocols (COAP). Communication protocols based on the exchange of messages (MQTT). Service discovery protocols. (8L)

Module IV
M2M and IoT Technology Fundamentals

Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management. (8L)

Module V
The data processing for IoT

Organization of data processing for the Internet of things. Cloud computing. Fog computing. Application case studies: Smart Grid. Home Automation. Smart City. (8L)

Text books:

Madisetti Vijay and BahgaArshdeep, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.(T1)

Raj Pethuru and Raman Anupama C., The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.(T2)

Reference books:

Vermesan Dr. Ovidiu, Friess Dr. Peter, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers.(R1)

Holler Jan, TsiatsisVlasios, Mulligan Catherine, Avesand Stefan, Karnouskos Stamatis, Boyle David, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**

Continuous Internal Assessment	√	√	√	√	√
Continuous Internal Assessment		**% Distribution**			
Semester End Examination	√	√	√	√	√
Mid semester examination			25		
Two quizzes			20 (2×10)		
Teacher's Assessment			5		

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	3	3	2	3	1	2	1	2	1	1	2	2	2	2
CO2	2	3	3	3	2	2	1	1	1	1	1	2	2	3	2
CO3	2	3	2	2	2	1	1	1	1	1	1	2	3	2	2
CO4	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2
CO5	2	3	3	3	2	1	1	2	1	1	1	3	3	2	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT446
Course title: **Internet of Things(IoT)Lab**
Pre-requisite(s): IT423 Internet of Things(IoT)Co-requisite(s):
Credits: L:0 T:0 P: 1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: VII
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Understand the basic concept and the Iot Paradigm
2.	Know the state of art architecture for IoT applications
3.	Learn the available protocols used for IoT
4.	Design basic IoT Applications.
5.	Evaluate optimal IoT applications.

Course Outcomes
After the completion of this course, students will be:

1.	Identify the IoT Components and its capabilities
2.	Explain the architectural view of IoT under real world constraints
3.	Analyse the different Network and link layer protocols
4.	Evaluate and choose among the transport layer protocols
5.	Design an IoT application

List of Programs as Assignments:

1. **Lab Assignment No: 1**
   Glowing LEDs.
   Toggling LED's.
2. **Lab Assignment No: 2**
   Transmitting a string through UART
   Controlling LEDs blinking pattern through UART.
3. **Lab Assignment No: 3**
   Echo each character typed on HyperTerminal
   Digital IO configuration.
   Timer based LED Toggle.

4. **Lab Assignment No: 4**
   Scanning the available SSID's in the range of Wi-FI Mote.
   Connect to the SSID of choice
5. **Lab Assignment No: 5**
   Demonstration of a peer to peer network topology.
   check the connectivity to any device in the same network.
6. **Lab Assignment No: 6**
   Send hello world to TCP server existing in the same network
   Reading of atmospheric pressure value from pressure sensor.
7. **Lab Assignment No: 7**
   I2C protocol study
   Reading Temperature and Relative Humidity value from the sensor.
   Reading Light intensity value from light sensor.
8. **Lab Assignment No: 8**
   Proximity detection with IR LED.
   Generation of alarm through
   Buzzer.
9. **Lab Assignment No: 9**
   Timestamp with
   RTCIO Expander.

   Relay control.
10. **Lab Assignment No: 10**
    I2C based 12-channel
    ADC EEPROM read
    and write
11. **Lab Assignment No: 11**
    Transmitting the measured physical value from the UbiSense Over the Air.

Text books:

Madisetti Vijay and BahgaArshdeep, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.(T1)

Raj Pethuru and Raman Anupama C., The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.(T2)

Reference books:

Vermesan Dr. Ovidiu, Friess Dr. Peter, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers.(R1)

Holler Jan, TsiatsisVlasios, Mulligan Catherine, Avesand Stefan, Karnouskos Stamatis, Boyle David, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets

CD7	Simulation

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
<u>Direct Assessment</u>

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

3. Student Feedback on Faculty
4. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	3	3	2	3	1	2	1	2	1	1	2	2	2	2
CO2	2	3	3	3	2	2	1	1	1	1	1	2	2	3	2
CO3	2	3	2	2	2	1	1	1	1	1	1	2	3	2	2
CO4	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2
CO5	2	3	3	3	2	1	1	2	1	1	1	3	3	2	2

COURSE INFORMATION SHEET

Course code: IT447
Course title: Big Data Analytics
Pre-requisite(s): CS237 Database Management System
Co- requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: VII
Branch: CSE/IT

Course Objectives

This course enables the students:

1.	To provide an overview of approaches facilitating data analytics on huge datasets in different domain.
2.	To provide the knowledge on NoSQL and different partitioning method to handle large datasets.
3.	To provide an overview of Apache Hadoop and HDFS Concepts and Interfacing with HDFS
4.	To understand Map Reduce Jobs in Hadoop framework
5.	To provide the knowledge of various Hadoop based tool for processing large datasets.

Course Outcomes

After the completion of this course, students will be able to:

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

Syllabus

Module I

Introduction

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics. (8L)

Module II

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations. (8L)

Module III

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures. (8L)

Module IV

MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats. (8L)

Module V

Hbase, data model and implementations, Hbase clients, Hbase examples, praxis.Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration, Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries. (8L)

Text Books:

Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.(T1)

P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.(T2)

Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.(3)

Reference Books:

ammer ,E., "Hadoop Operations," O'Reilley, 2012.(R1)
Capriolo ,E., Wampler ,D., and Rutherglen ,J., "Programming Hive," O'Reilley,2012.(R2)
George ,L., "HBase: The Definitive Guide," O'Reilley, 2011.(R3)Gates
,A., "Programming Pig," O'Reilley, 2011.(R4)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Direct Assessment

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	2	2	1	1	1	1	1	1	1	1	2	3	1	1
CO2	2	2	2	2	3	1	1	1	2	2	2	2	2	2	3
CO3	2	2	2	1	3	2	2	2	3	2	1	2	3	2	3
CO4	3	2	3	2	3	2	2	2	2	2	2	2	3	3	3
CO5	3	3	3	3	3	2	2	2	2	2	3	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT448
Course title: Big Data Analytics Lab
Pre-requisite(s): IT447 Big Data Analytics
Co- requisite(s):
Credits: L:0 T: 0 P: 1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: VII
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	To implement MapReduce programs for processing big data
2.	To realize storage of big data using H base, Mongo DB
3.	To analyze big data using linear models
4.	To analyze big data using machine learning techniques such as SVM Decision tree classification and clustering

Course Outcomes
After the completion of this course, students will be able to:

CO1	Process big data using Hadoop framework
CO2	Build and apply linear and logistic regression models
CO3	Perform data analysis with machine learning methods
CO4	Perform graphical data analysis
CO5	Simulate basic Engineering problems

SYLLABUS

List of Programs as Assignments:

Lab Assignment No: 1

Objective:

Q1. To draw and explain Hadoop Architecture and Ecosystem with the help of a case study using WorkCount example. To define and install Hadoop.

Lab Assignment No: 2

Objective:

Q1. To implement the following file management tasks in Hadoop System (HDFS): Adding files and directories, Retrieving files, Deleting files

Lab Assignment No: 3

Objective:

Q1.To run a basic Word Count MapReduce program to understand MapReduce Paradigm: To count words in a given file, to view the output file, and to calculate execution time.

Lab Assignment No: 4

Objective:

Q1. Implement word count / frequency programs using MapReduce

Lab Assignment No: 5

Objective:

Q1.To study and implement basic functions and commands in R Programming.

Lab Assignment No: 6

Objective:

Q1. To implement Bloom Filters for filter on Stream Data in C++/java.

Lab Assignment No: 7

Objective:

Q1.To implement Bloom Filters for filter on Stream Data in C++/java.

Lab Assignment No: 8

Objective:

Q1.To implement clustering program using R programming.

Lab Assignment No: 9

Objective:

Q1. Visualize data using any plotting framework

Lab Assignment No: 10

Objective:

Q1.Implement an application that stores big data in Hbase / MongoDB / Pig using Hadoop / R.

Books recommended:

TEXT BOOKS

VigneshPrajapati, “Big Data Analytics with R and Hadoop”, Packet Publishing

REFERENCE BOOKS

1. Tom White, “Hadoop: The Definitive Guide”, Second Edition, O’Reilly Yahoo Press
2. Robert D. Schneider, “Hadoop for Dummies”, Wiley.

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	1	1	1	1	1	1	1	1	2	3	1	1
CO2	2	2	2	2	3	1	1	1	2	2	2	2	2	2	3
CO3	2	2	2	1	3	2	2	2	3	2	1	2	3	2	3
CO4	3	2	3	2	3	2	2	2	2	2	2	2	3	3	3
CO5	3	3	3	3	3	2	2	2	2	2	3	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

COURSE INFORMATION SHEET

Course code: CS347
Course title**: Soft Computing**
Pre-requisite(s): MA205 Discrete Mathematics
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: VII
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the concept of fuzzy logic and controllers
2.	To understand the various architectures of ANN and its learning methods
3.	To learn about basic concepts of genetic algorithm and its operators
4.	To understand the Artificial Neural Networks
5.	To understand the Genetic Algorithms

Course Outcomes

After the completion of this course, students will be able to:

1.	Solve numerical on Fuzzy sets and Fuzzy Reasoning.
2.	Develop Fuzzy Inference System (FIS).
3.	Solve problems on Genetic Algorithms
4.	Explain concepts of neural networks
5.	Develop neural networks models for various applications.

Syllabus

Module I
Fuzzy Set Theory: Basic Definition and Terminology, Set Theoretic Operations, Fuzzy types and levels, MF Formulation and Parameterization, MF of two dimensions, Fuzzy Union, Intersection and Complement, Fuzzy Number,Fuzzy measure. (8L)

Module II

Fuzzy Logic: Fuzzy Rules and Fuzzy Reasoning:Extension Principles and Fuzzy Relations, Fuzzy IF THEN Rules, Defuzzification,FuzzyReasoning.Fuzzy Inference System: Introduction, Mamdani Fuzzy Models, Other Variants, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models. (8L)

Module III

Fundamentals of Genetic Algorithms: Basic Concepts, Creation of Offsprings, Encoding,

Fitness Functions, Reproduction, Genetic Modelling: Inheritance Operators, Cross over, Inversion and detection, Mutation operator, Bitwise operators. (8L)

Module IV

Introduction to Artificial Neural Networks: What is a Neural Network? Human Brain, Models of Neuron, Neural Network viewed as Directed Graphs, Feedback, Network Architecture, Knowledge Representation, Learning processes:(Error correction, Memory-Based, Hebbian ,Competitive,Boltzman ,Supervised,Unsupervised),Memory,Adaptation. (8L)

Module V

Perceptrons, Adaline, Back Propagation Algorithm, Methods of Speeding, Convolution Networks, Radical Basis Function Networks, Covers Theorem, Interpolation Learning, The Hopfield Network. (8L)

Text Books:

1. Jang J.S.R., Sun C.T. and Mizutani E., "Neuro-Fuzzy and Soft Computing" PHI/Pearson Education, New Delhi 2004.(T1)
2. Rajasekaran S. & Vijayalakshmi G.A. Pai, PHI, New Delhi 2003.(T2)
3. Ross T. J., "Fuzzy Logic with Engineering Applications." TMH, New York, 1997.(T3)
4. HaykinsSimon ,"Neural Networks :A Comprehensive Foundation, Pearson Education,2002.(T4)

Reference Books:

1. Ray K.S. ,"Soft Computing and Its application", Vol 1, Apple Academic Press, 2015. (R1)
2. Lee K.H. ,"First Course on Fuzzy Theory and App.", Adv in Soft Computing Spinger, 2005.(R2)
3. Zimmermann H.Z. ,"Fuzzy Set Theory and its App " , 4th Edition, Spinger Science, 2001.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	2	1	1	1	2	2	1	2	2	3	2
CO2	3	3	3	3	3	3	3	1	3	3	1	2	3	3	3
CO3	3	3	3	3	2	2	1	1	2	2	1	2	3	3	2
CO4	3	3	3	3	3	2	1	1	1	2	1	2	3	3	2
CO5	3	3	3	3	3	2	1	1	1	2	1	2	3	3	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

PROGRAMME ELECTIVE -V

COURSE INFORMATION SHEET

Course code: IT449
Course title: **Information Retrieval**
Pre-requisite(s): Design of Algorithms
Co- requisite(s): NIL
Credits: L: 3 T: 1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: VII
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	To understand the basic component of data retrieval.
2.	To explore the application areas of information retrieval.
3.	To understand the idea of indexing and pre-processing of data.
4.	To explore the different IR evolution techniques.
5.	To understand the concepts of Query Expansion techniques.

Course Outcomes
After the completion of this course, students will be able to:

1.	Explain the working of a search engine and details of the individual components.
2.	Apply efficient techniques for the indexing of documents
3.	Implement various indexing, scoring, ranking and relevance feedback models and techniques for information retrieval
4.	Develop a complete IR system from scratch
5.	Evaluate and analyse the performance of a retrieval systems using a suitable test collection

Syllabus

Module I
Introduction
Introduction; Search Engine Architecture; An overview of crawling, text transformation, index creation, user interaction, ranking, link analysis, evaluation and deep web. (8L)

Module II
Pre-processing and Indexing

Pre-processing: tokenization, stop word, normalization, stemming, wildcard queries, spelling correction – edit distance and k-gram; Indexing: Index construction; Index compression. (12L)

Module III
Scoring
Parametric and zone indexes; term frequency and weighting; vector space model; efficient scoring and ranking; vector space scoring. (8L)

Module IV
IR Evaluation

Evaluation; Standard test collection; Evaluation of unranked and ranked retrieval; Assessing relevance; System quality and user utility. (6L)

Module V
Relevance Feedback and Query Expansion

Relevance feedback and pseudo relevance feedback; query reformulation. (6L)

Text book:

Manning, Christopher D., Raghavan Prabhakar, and SchützeHinrich, "Introduction to Information Retrieval", Cambridge: Cambridge University Press, 2008.(T1)

Reference books:

Grossman David A., Frieder Ophir "Information Retrieval: Algorithms and Heuristics", Springer.(R1)

Croft Bruce, Metzler Donald, and Strohman Trevor "Search Engines: Information Retrieval in Practice", Pearson Education, 2009.(R2)

Ricardo Baeza-Yates and Neto Berthier Ribeiro "Modern Information Retrieval", 2nd Edition, Addison-Wesley, 2011.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20(2x10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	□	□	□	□	□
Semester End Examination	□	□	□	□	□

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	3	3	3	2	2	1	1	2	2	1	1	3	3	2
CO2	3	3	2	3	3	2	2	1	3	2	1	1	2	3	3
CO3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	3
CO4	3	3	3	2	2	3	3	1	2	2	2	2	3	3	2
CO5	2	3	3	3	3	3	2	1	2	2	2	1	2	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT450
Course title: **Information Retrieval Lab**
Pre-requisite(s): NIL
Co- requisite(s): Information Retrieval
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level:VII
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	To understand the basic component of data retrieval.
2.	To explore the application areas of information retrieval.
3.	To understand the idea of indexing and pre-processing of data.
4.	To explore the different IR evolution techniques.
5.	To be familiar with current R&D scenario in information retrieval.

Course Outcomes

After the completion of this course, students will be able to:

1.	Explain the working of a search engine and details of the individual components.
2.	Apply efficient techniques for the indexing of documents
3.	Implement various indexing, scoring, ranking and relevance feedback models and techniques for information retrieval
4.	Develop a complete IR system from scratch
5.	Evaluate and analyze the performance of a retrieval systems using a suitable test collection

Syllabus

List of Assignments

1. Assignment on making a corpus and preprocessing: (a) search the web using a recent event and collect 50 news articles from various sources – this collection is 'myCorpus', (b) perform stop word removal and stemming of the documents.
2. Assignments on term-document matrix: Build term-document matrix using 'myCorpus' and top N frequent terms. Now find similarity between the documents using any distance metric.
3. Vary N and choose other distance matrices and perform experiments. Find two documents that have the highest similarity and two documents having the lowest similarity. Manually verify the documents and comment on the value of N and performance of the similarity metrices.
4. Experiments with TfIdf and applications of TfIdf using a given dataset.
5. Experiments with Zips law on Reuters21578 corpus and another Indian language corpus.
6. Assignments on construction of an Inverted Index using a given corpus.
7. Form 3 suitable queries manually and retrieve documents from ' myCorpus'. Perform experiments on various retrieval models.
8. Implement and evaluate algorithms for index compression.
9. Experiments on studying an available crawler and building own toy crawler for performing specific task.
10. Experiments on Unranked Evaluation Measures: Manually label the set of documents corresponding to each query. Now compare the system-retrieved documents with manually labelled set of documents and compute Precision, Recall, F-measure.
11. Experiments on Ranked Retrieval and Evaluation: Select a task from Forum for Information Retrieval Evaluation(FIRE) resources, use the available dataset(http://fire.irsi.res.in/fire/static/resources) to design a IR system. Then evaluate your system using the given procedure.

Text book:

Manning, Christopher D., Raghavan Prabhakar, and SchützeHinrich, "Introduction to Information Retrieval", Cambridge: Cambridge University Press, 2008.(T1)

Reference books:

Grossman David A., Frieder Ophir "Information Retrieval: Algorithms and Heuristics", Springer.(R1)

Croft Bruce, Metzler Donald, and Strohman Trevor "Search Engines: Information Retrieval in Practice", Pearson Education, 2009.(R2)

Edition Ricardo Baeza-Yates and Neto Berthier Ribeiro "Modern Information Retrieval", 2nd, Addison-Wesley, 2011.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	3	3	3	2	2	1	1	2	2	1	1	3	3	2
CO2	3	3	2	3	3	2	2	1	3	2	1	1	2	3	3
CO3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	3
CO4	3	3	3	2	2	3	3	1	2	2	2	2	3	3	2
CO5	2	3	3	3	3	3	2	1	2	2	2	1	2	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code:IT451
Course title: **Cloud Computing**
Pre-requisites: Basics of Intelligent Computing
Co- requisite(s): NIL
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level:VII
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Understand the elements of distributed computing and core aspects of cloud Computing.
2.	Understand the concepts and aspects of virtualization and application of virtualization technologies in cloud computing environment
3.	Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS and gain comprehensive knowledge of different types of clouds.
4.	Be familiar with application development and deployment using services of different cloud computing technologies provider: Google app Engine, Amazon Web Services (AWS) and Microsoft Azure.
5.	Understanding the key security, compliance, and confidentiality challenges in cloud computing.

Course Outcomes:
After the completion of this course, students will be able to:

1.	Recall the various aspects of cloud computing and distributed computing
2.	Understand the specifics of virtualization and cloud computing architectures.
3.	Develop and deploy cloud application using services of different cloud computing technologies provider: Google app Engine, Amazon Web Services (AWS) and Microsoft Azure.
4.	Evaluate the security and operational aspects in cloud system design, identify and deploy appropriate design choices when solving real-world cloud computing problems.
5.	Provide recommendations on cloud computing solutions for a Green enterprise.

Syllabus

Module I

Introduction: Essentials, Benefits and need for Cloud Computing - Business and IT Perspective - Cloud and Virtualization - Cloud Services Requirements - Cloud and Dynamic Infrastructure - Cloud Computing Characteristics Cloud Adoption. (8L)

Module II

Principles of Parallel and Distributed Computing: Eras of computing, Parallel vs. Distributed computing, Elements of parallel computing, Elements of distributed computing, Technologies for distributed computing.

(8L)

Module III

Virtualization: Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples.

Storage virtualization:Storage Area Networks - Network-Attached storage - Cloud Server Virtualization - Virtualized Data Centre. (8L)

Module IV

Cloud computing architecture: Introduction, Cloud reference model, Types of clouds, Economics of the cloud, Open challenges. (8L)

Module V

Cloud platforms in industry and Cloud applications : Amazon web services, Google app engine, Microsoft azure, Observations, Scientific applications, Scientific, Business and Consumer applications. (8L)

Text Book:

Buyya Raj Kumar, Vecchiola Christian &Thamarai S. Selvi, "Mastering Cloud Computing", McGraw Hill Publication, New Delhi, 2013.(T1)

Reference Books:

Velte T., Velte A. and Elsenpeter R., "Cloud Computing: A Practical Approach", McGraw Hill, India.(R1)

Buyya R., Broberg J., "Cloud Computing: Principles and Paradigms", Wiley.(R2)

Hwang K., Fox G. and Dongarra J., "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann, 2012.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	2	3	2	2	1	2	2	2	3	3	3
CO2	3	3	3	3	3	3	2	2	1	2	2	2	3	2	3
CO3	3	3	3	2	3	3	2	2	1	2	2	2	3	3	3
CO4	3	3	3	3	3	2	2	2	2	2	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	2	2	2	2	2	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course Code: IT452

Course Title: Cloud Computing Lab

Pre-requisite(s): Java thread programming, Eclipse, Any web framework (Java, .Net, Python, Ruby etc.), Aneka platform and framework, Hadoop Framework.

Co- requisite(s): Network Programming, Operating system, distributed and parallel programming framework.

Credits: L: T: P: 1.5

Class schedule per week: 3

Class: B. Tech

Semester / Level:

Branch: CSE/IT

Course Objectives

This course enables the students:

1.	Understand Cloud Sim setup first and then implement various task scheduling, resource allocation and resource provisioning based on QoS/ SLA algorithms on Cloud Simulator.
2	Understand various web services, web applications and API. Design and develop different web application and cloud-based application using enterprise cloud like Amazon Web Services, Google App. Engine, Microsoft Azure etc.
3.	Understand the difference between conventional thread programming and Aneka thread programming model and analyse them using various programming exercises.
4.	Understand image decomposition, filtering, histogram, convolution, resolution, scalability techniques etc. using Task Programming Model supported in Aneka and MapReduce programming model supported in Aneka and compare their results.
5.	Understand the designing of different workflows according to requirements and apply MapReduce programming model supported in Aneka.

Course Outcomes

After the completion of this course, students will be able to:

1.	Recall the various cloud computing setup like Cloud Sim, Aneka platform and framework, Hadoop framework etc.
2.	Understand the different task scheduling algorithms, resource allocation algorithms and resource provisioning based on QoS/ SLA and apply Cloud Simulator.
3.	Analyze the difference between conventional thread programming model, Aneka thread programming model by using various programming exercises (Like-texts print, mathematical problems etc.)
4.	Evaluate different mathematical problems and image processing techniques (like- image filtering, decomposition, convolution, scalability, resolution etc. techniques) using Task Programming Model supported in Aneka and MapReduce programming model supported in Aneka and compare their results.
5.	Develop and deploy various web applications using AWS, Google App. Engine, Microsoft Azure etc. And create different services (Like-compute, storage, application services etc.) using AWS, Google App. Engine, etc.

Syllabus

Module I: <u>Cloud Sim (latest version -5.0) Programs</u>

1. Implement different task scheduling algorithms like FCFS, Round Robin, SJF, Max-min Min-min algorithms etc. using cloud Simulator.
2. Implement different Resource allocation algorithms like GA, BFO, Simulated annealing, Hill Climbing, best first search etc. using cloud Simulator.
3. Implement resource provisioning based on QoS/ SLA on Cloud Simulator.

Module II: <u>Develop and Deploy Web Application and use API for integrating two applications:</u>

1. Web services API integration from Client App. to Cloud App.
2. Install Amazon Web Service to develop and deploy the web applications.
3. Install Google App. Engine to launch the web applications.
4. Install Windows Azure 2 to develop and deploy the web applications

Module III: <u>Aneka cloud program (Aneka Thread Programming, Aneka Task Programming model):</u>

1. Write a program to print "Hello World" using Aneka Thread Programming model and Conventional Thread and Understand the differences?
2. Write a program to print "Hello World" using Aneka Thread Programming model use Single Thread?
3. Write a program to print "Hello World" based on Thread model and use exactly five threads also print the executor node information along with the Submission Time and Completion Time?
4. Write a program to compute the following mathematical equation using Aneka Threads (Note: Consider each trigonometric function in independent thread)? $P= \sin(x) + \cos(y) + \tan(z)$
5. Write a program to sum the two numbers using Aneka Task Programming model?
6. Write a program to compute the matrix addition using Aneka Thread Programming Model.
7. Write a program to compute the matrix multiplication using Aneka Thread Programming Model.
8. Write a program to decompose the image into 25 parts(5X5) and apply histogram (dynamic stretch)
9. Write a program for Image Convolution using Task Programming Model.
10. Using a Thread programming model supported in Aneka, develop a program for parallel multiplication of two very large square matrices or order greater than 500. Conduct and report results of scalability experiments by varying the order of matrix from 500 to 1000 in steps of 100 on computing nodes/workers varying from 10 to 50 in step of 10 in an Aneka-based enterprise Cloud.

Module IV: MapReduce programming model supported in Aneka

1. Using a MapReduce programming model supported in Aneka, develop a program for image filtering of hundreds of photos you have taken using digital camera. Conduct and report results of scalability experiments by varying the number of computing nodes/workers and images of different resolutions or file size on an Aneka-based enterprise Cloud.
2. Write a program using Map/Reduce to count the words in the given input set.

Module V: Enterprise Cloud: advance programming

1. To create and access VM instances and demonstrate various components such as EC2, S3, Simple DB, EBS, etc. technologies using AWS console, API, and web services.
2. To create GFS, Big Tables, Google NO SQL system, Chubby, Google Distributed Lock services using programming support for Google App. Engine.

Text Book:

1. Rajkumar Buyya, C. Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, McGraw Hill
2. Nick Antonopoulos and Lee Gillam, Cloud Computing: Principles, Systems and Applications, Editors, springer publication.
3. Cloud Computing Principles and Paradigms, Rajkumar Buyya Wiley.
4. Distributed and Cloud Computing, Kai Hwang, Mk Publication
5. Cloud computing Black Book Dreamtech Publication

References Books:

1. Using Google Apps engine O'reilly Publication
2. Programming Amazon EC2, O'reilly Publication
3. Cloud security, Ronald L. Wiley Publication
4. Cloud computing Dr. Kumar Saurabh, wily Publication
5. Virtualization for Dummies, Wiley Publication
6. John W. Rittinghouse, JamesF. Ran some, Cloud Computing: Implementation, management and security, CRC Press, Taylor and Francis Publication

Direct Assessment (CBCS)

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	**50**
Semester End Examination	**50**

Continuous Internal Assessment	% Distribution
Mid semester examination (Day to day performance+ File+ Lab quiz)	**30+10+10=50**
End Examination (Performance and Viva)	**30+20=50**

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

COURSE INFORMATION SHEET

Course code: IT453
Course title: **. NET Programming**
Pre-
requisite(s):
NilCo-
requisite(s):
Credits: L:3 T:0 P:0
Class schedule per
week: 3 Class: B.
Tech
Semester / Level: VII
Branch:
CSE/IT

Course Objectives
This course enables the students:

1.	To study basic and advanced features of the C# language
2.	To create form based and web based applications
3.	To study the internals of the .NET framework
4.	To know and study about the Common Language Runtime (CLR) and Common Language Infrastructure (CLI)

Course Outcomes

After the completion of this course, students will be able to:

1.	Install and configure Dot Net application development tools.
2.	develop, implement and creating Applications with C#
3	develop, implement, and demonstrate Component Services, Threading, Remoting, Windows services, web
4.	explain Security in the .NET framework and Deployment in the .NET.
5.	develop Assemblies and Deployment in .NET, Mobile Application Development.

Syllabus

Module I
C# basics
C# and the .NET framework – C# basics – Objects and types – Inheritance –Arrays – Operators and casts – Indexers. (8L)

Module II
Advanced C# features

Delegates and events – Strings and regular expressions – Generics – Collections–Memory management and pointers – Errors and exceptions. (8L)

Module III
I/O and network programming

Tracing and events - threading and synchronization - .Net security – localization –Manipulating XML - Managing the file system – basic network programming. (8L)

Module IV
Window and web applications

Window based applications – Data access with .NET – basics of ASP .NET -Introduction to web services. (8L)

Module V
.NET Features

Architecture – Assemblies – shared assemblies – CLR hosting – Appdomains –Reflection. (8L)

Text Books:

Nagel,C. , Evjen,B. , Glynn,J. , Watson,K. , and Skinner,M.,“Professional C# 4 with .NET 4,” Wiley India, 2010.(T1)

Liberty ,J., and MacDonald ,B., “Learning C# 3.0,” First Edition ,O’Reilly, 2008.(T2)

References Book:

Troelson ,A., “Pro C# 5.0 and the.NET 4.5 Framework,” Sixth Edition, Apress,2012.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	1	1	3	1	2	2	1	1	1	2	2	1	2
CO2	3	3	3	3	3	2	2	2	2	2	2	2	3	2	3
CO3	3	3	3	3	3	2	2	2	2	2	2	2	3	3	3
CO4	2	3	3	1	3	2	2	2	3	3	3	3	2	2	3
CO5	3	3	3	3	3	1	1	2	2	2	3	3	3	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT454
Course title: **. NET Programming Lab**
Pre-requisite(s): NET Programming
Co- requisite(s):
Credits: L:0 T:0 P:3
Class schedule per week: 3
Class: B. Tech
Semester / Level: VII
Branch: CSE/IT

Course Objectives

This course enables the students:

1.	To study basic and advanced features of the C# language
2.	To create form based and web based applications
3.	To study the internals of the .NET framework
4.	To know and study about the Common Language Runtime (CLR) and Common Language Infrastructure (CLI)

Course Outcomes

After the completion of this course, students will be able to:

1.	Create Simple application using web controls
2.	Work with States of ASP. NET Pages & Adrotator Control
3	Use of calendar control, Treeview control & Validation controls
4.	Query textbox and Displaying records & Display records by using database
5.	implement the algorithms in C#.net, VB.net and ASP.net

Course Outcomes
After the completion of this course, students will be able to:

Syllabus:

List of experiments:

1. Simple application using web controls
    a) Finding factorial Value
    b) Money Conversion
    c) Quadratic Equation
    d) Temperature Conversion
    e) Login control
2. States of ASP.NET Pages
3. Adrotator Control
4. Calendar control
    a) Display messages in a calendar control
    b) Display vacation in a calendar control
    c) Selected day in a calendar control using style
    d) Difference between two calendar dates
5. Treeview control
    a) Treeview control and datalist
    b) Treeview operations
6. Validation controls
7. Query textbox and Displaying records
8. Display records by using database

Text Books:

Nagel,C. , Evjen,B. , Glynn,J. , Watson,K. , and Skinner,M.,"Professional C# 4 with .NET 4," Wiley India, 2010.(T1)

Liberty ,J., and MacDonald ,B., "Learning C# 3.0," First Edition ,O'Reilly, 2008.(T2)

References Book:

Troelson ,A., "Pro C# 5.0 and the.NET 4.5 Framework," Sixth Edition, Apress,2012.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	1	1	3	1	2	2	1	1	1	2	2	1	2
CO2	3	3	3	3	3	2	2	2	2	2	2	2	3	2	3
CO3	3	3	3	3	3	2	2	2	2	2	2	2	3	3	3
CO4	2	3	3	1	3	2	2	2	3	3	3	3	2	2	3
CO5	3	3	3	3	3	1	1	2	2	2	3	3	3	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

OPEN ELECTIVES(OE)*

OFFERED FOR LEVEL 1-4

OPEN ELECTIVES-I

COURSE INFORMATION SHEET

Course code: CS 261
Course title: Fundamentals of Data Structures
Pre-requisite(s): NIL
Co- requisite(s):
Credits:3 L:3 T:0 P:0
Class schedule per week: 03
Class: B.Tech
Semester / Level: IV/2
Branch: CS/IT

Course Objectives

This course enables the students:

1.	To Understand the necessity of Data Structures while solving the problem through Computer
2.	To Understand the limitations of Computer Program
3.	To acquire the knowledge of Abstract Data types and Representation in Computer Memory.
4.	To differentiate Array and Link list Implementation
5.	To Convert Practical Problems into Computer Compatible problems

Course Outcomes

After the completion of this course, students will be able to:

1.	Apply in the Respective field of Different Discipline.
2.	Visualize the use of Linear and Non-Linear Data Structures
3.	Handle operations like searching, Sorting, insertion, deletion, traversing mechanism.
4.	Apply Concepts Learned to tackle the issue on Programming
5.	Choose/Select appropriate/suitable Data Structure for the given Problem.

Syllabus

Module I **[8 L]**

Introduction to Data Structures, Abstract data types, Time and space complexity, Asymptotic Notations, Array Operations, Memory Representations of Multi-Dimensional Array.

Module II **[8 L]**

Stacks and Queue Operations, Applications of Stack and Queue, Types of Queues and their Operations, Limitations, and applications

Module III **[8 L]**

Linear list – singly linked list implementation and its operations, circular linked list implementation, Double linked list implementation, insertion, deletion and searching operations on the types of Lists. Applications of linked lists.

Module IV **[8 L]**

Trees – Definitions, tree representation, properties of trees, Types of Trees and their applications, tree traversals, tree implementation.

Graph, representations of graph, Types of Graphs, Operations and applications of Graph.

Module V **[8 L]**

Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort. Searching-linear and binary search, comparison among sorting and searching methods.

Text Books:

1. Sahni Horwitz,, Freed Anderson, Fundamentals of Data Structures in C, 2nd Edition (or latest) , University Press.(T1)

Reference Books:

1. Thareja Reema, Data Structures Using C, 2nd Edition, Oxford University Press.(R1)
2. Tanenbaum, Langsam, Augenstein, Data Structures using C, Pearson. (R2)

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS &EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
✓ Continuous Internal Assessment	✓	✓	✓	✓	✓
✓ Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets

CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes**							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	2	1	3	2	3	1
CO2	3	1	3	3	2	2	2	1
CO3	2	2	1	1	2	2	3	1
CO4	3	2	1	3	3	1	2	1
CO5	2	3	2	3	3	2	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD3,CD6
CO3	CD1, CD3,CD6
CO4	CD1, CD3,CD6
CO5	CD2, CD3, CD6

COURSE INFORMATION SHEET

Course code: IT263
Course title: Object Oriented Programming Concepts

Pre-requisite(s): Data StructureCo- requisite(s):
Credits: L: 3 T: 0 P: 0 Class schedule per week: 3
Class: B. Tech
Semester / Level: II/2
Branch: IT

Course Objectives

This course enables the students:

1.	The course shall allow students to understand the Object-Oriented Programming concepts and basic characteristics of Java.
2.	The course shall allow students to know the principles of packages, inheritance and interfaces
3.	The course will help students understand the application OOP principles in various use cases.
4.	The course will help students to develop a java application with threads, generics classes, GUI components-based applications
5.	The course aims to expose students to newer JAVA constructs like NIO, Lambdas etc.

Course Outcomes

After the completion of this course, students will be:

1.	Develop Java programs using OOP principles
2.	Develop Java programs with the concept's inheritance and interfaces
3.	Build Java applications using exceptions and I/O streams
4.	Develop Java applications with threads and generics classes
5.	Develop interactive Java programs using swings

SYLLABUS

Module I

INTRODUCTION TO OOP AND JAVA FUNDAMENTALS (10L)

Object Oriented Programming – Abstraction – objects and classes – Encapsulation- Inheritance – Polymorphism- OOP in Java – Characteristics of Java – The Java Environment – Java Source File Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers – static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages – JavaDoc comments.

Module II

INHERITANCE, INTERFACES, Strings, AND Regular Expression

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces – Object cloning -inner classes, ArrayLists – Strings, Working with the String and StringBuilder class, Character class, Tokenizing strings, Regular Expressions.

Module III

EXCEPTION HANDLING AND I/O

Exceptions – exception hierarchy – throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements, Files and Streams, Using NIO classes, Sequential file handling, Object serialization.

Module IV

MULTITHREADING AND GENERIC PROGRAMMING (8L)

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

Module V

EVENT DRIVEN PROGRAMMING 9

Graphics programming – Frame – Components – working with 2D shapes – Using color, fonts, and images – Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – Introduction to Swing – layout management – Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

Text book:

1. Herbert Schildt, ―Java The complete reference‖, 9th Edition, McGraw Hill Education, 2017.

2. Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals‖, 9th Edition, Prentice Hall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers‖, 3rd Edition, Pearson, 2015.

2. Steven Holzner, ―Java 2 Black book‖, Dreamtech press, 2011.Gaps in the syllabus (to meet Industry/Profession requirements): *NIA*

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD#	Course Delivery methods
CDl	Lecture by use of boards/LCD projectors/OHP projectors
CO2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CDS	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use ofNPTEL materials and intemets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Assessment tool	**% contribution during co assessment**
Quiz (s)	10 X 5 =50
End semester examination	50

COURSE INFORMATION SHEET

Course code: CS361
Course title: Database System Concepts
Pre-requisite(s): Data Structures.
Co- requisite(s):
Credits: L: 3 T:0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	Understand the fundamental concepts, historical perspectives, current trends, structures, operations and functions of different components of databases.
2.	Recognize the importance of database analysis and design in the implementation of any database application.
3.	Describe the role of transaction processing in a database system.
4.	Understand various concurrency control mechanisms for a database system.
5.	Describe the roles of recovery and security in a database system.

Course Outcomes

After the completion of this course, students will be able to:

1.	Analyze data organization requirements and their inter relationships.
2.	Illustrate the features of data models and their application for storing data.
3.	Design queries to maintain and retrieve useful information from the databases created.
4.	Analyze the physical database design with respect to their expected performance using normalization.
5.	Examine the best practices according to concepts of indexing, transaction control and concurrency maintenance

Syllabus

Module I **Database Design and Entity - Relational Model**

Purpose of Database System; View of Data, Database Languages, Transaction Management, Database architecture, Database Users and Administrator, Types of database System, Overview of design process, E-R model, Constraints, E–R Diagram, E-R Diagram issues, Weak Entity Sets, Extended E – R Features, Reduction to E–R Schemas. (8L)

Module II

Relational Model and Query Languages

Structure of Relational Database, Codd's Rules, Fundamental Relational Algebra Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations, Data definition, Basic structure of SQL queries, Set Operations, Aggregate Functions, Null Values, Nested Sub Queries, complex queries, views, modification of database, Joined relations, SQL data types & schemas, Integrity constraints, authorization, Embedded SQL, Triggers. (8L)

Module III

Relational Database Design

Functional dependency, Decomposition, Normalization, First normal form, Second normal form, Third normal form, BCNF, Multivalued dependencies and Fourth normal form, Join dependencies and fifth normal form, DKNF. (8L)

Module IV

Transaction Processing Concepts

Introduction to Transaction processing, Transaction and system concepts, Desirable properties of Transaction, Schedules and recoverability, serializability of schedules, Transaction support in SQL. (8L)

Module V

Concurrency Control and Recovery

Locking techniques for concurrency control, Concurrency control based on Timestamp ordering, Multiversion concurrency control techniques, Recovery concepts, Recovery techniques based on Deferred update & Immediate update, Shadow paging. (8L)

Text Book:

Silberschatz A. et.al, Database System Concepts, 6th Edition, Tata Mc-Graw Hill, New Delhi, 2011. (T1)

Reference Books:

Elmasri R., Fundamentals of Database Systems, 7thEdition, Pearson Education, New Delhi, 2016. (R1)

Ullman Jeffrey D et.al., A First course in Database Systems, 3rd Edition, Pearson Education, New Delhi- 2014.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments

CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO2	3	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO3	3	1	3	3	3	3	2	1	1	2	1	2	3	2	3
CO4	3	1	3	3	3	3	2	1	1	2	2	3	3	2	3
CO5	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT361
Course title: Basics of Intelligent Computing
Pre-requisite(s): NIL
Co- requisite(s):
Credits:3 L:3 T:0 P:0
Class schedule per week: 03
Class: B.Tech
Semester / Level: IV/2
Branch: CS/IT

Course Objectives
This course enables the students:

A.	To know the basic functions of different AI branches.
B.	To understand the functionalities of IoT .
C.	To know the application of fuzzy logic.
D.	To understand the basic functionalities of a cloud based system.
E.	To find the basic functions of soft computing.

Course Outcomes:
After the completion of this course, students will be able to:

1.	Identify the difference between different branches of AI.
2.	Analyze a fuzzy based system.
3.	Design Neural Networks to solve problems.
4.	Analyze a problem in terms of ANN point of view.
5.	Identify the components of a cloud-based system.

SYLLABUS

Module I
Introduction

Definition of Computing, Conventional Computing vs. Intelligent Computing, Necessity of Intelligent Computing, Current trends in Intelligent Computing

AI Concepts
Introduction to AI, AI problems and Solution approaches, Fundamentals of problem solving using Search and Heuristics, Overview of Knowledge-base creation, and Intelligent Agents, Classification of AI.

(8 L)

Module II
Introduction to Soft Computing

Hard Computing vs. Soft Computing, Paradigms of Soft Computing, Real Life applications of Soft Computing

Fuzzy Logic
Classical Sets Vs Fuzzy Sets, Membership Functions, Fuzzy operations, Fuzzy Relations, Fuzzy Composition (Max-Min, Max-Product), Defuzzification, Fuzzy Inference System

Genetic Algorithm
Principle of Optimization, Traditional vs Evolutionary optimization, Genetic Algorithm: Working Cycle of GA, Encoding, Crossover, Mutation.(8 L)

Module III
Introduction to Artificial Neural Networks:

Biological Neuron to Artificial Neuron, Mc-Culloh Pitts Perceptron Model, Layer of Neurons, Activation Function, Artificial Learning, Types of Learning, Introduction to Back Propagation Networks, Applications of Neural Network. (8L)

Module IV
Introduction to Cloud computing

Conventional Computing, Historical developments, Defining a Cloud, Cloud Computing reference model, Overview of Virtualization: Introduction, Types of cloud, Cloud Platforms: Amazon Web Services, Microsoft Azure, Cloud Applications (8L)

ModuleV
Introduction to IOT
The IoT Paradigm, Concept of Things, IoT Hardware, IoT Protocols, IoT Architecture, enabling technologies of IoT, IoT Designing and its levels. (8L)

Text books:

1. Rich Elaine, Knight Kevin, Nair S. B. Artificial Intelligence, 3rd Edition, Tata Mc. Graw Hill.
2. Padhy N. P., Simon S. P. Soft Computing: With MATLAB Programming, Oxford UniversityPress, 2015.
3. Buyya Raj Kumar, Vecchiola Christian &Selvi S.Thamarai , Mastering Cloud Computing, McGraw Hill Publication, New Delhi, 2013.
4. Madisetti Vijay and BahgaArshdeep, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.

Reference Books:

Raj Pethuru and Raman AnupamaC.,The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.

Konar Amit, Computational Intelligence: Principles, Techniques and Applications, Springer.

Shivanandam and Deepa, Principles of Soft Computing, 2nd Edition, John Wiley and Sons, 2011.

CD #	**Course Delivery methods**
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

Mapping of Course Outcomes onto Program Outcomes

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	1	1	1	2	2	1	1	1	2	3	1	1
CO2	3	3	3	2	1	2	2	2	2	1	1	2	2	3	2
CO3	3	3	3	2	2	1	2	2	2	2	1	3	2	3	2
CO4	3	3	3	3	2	2	2	3	2	2	1	3	3	2	3
CO5	2	2	1	1	2	1	2	3	1	1	1	2	2	2	1

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

OPEN ELECTIVES-II

COURSE INFORMATION SHEET

Course Code: IT361
Course Title: Basics of Software Engineering
Pre-requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3

Course Objectives

This course enables the students:

A.	To explore the basic Software Engineering principles and practices
B.	To learn about various software development processes and apply this in real life applications of product development
C.	To explore various testing techniques and toolsto improve the quality of software
D.	Apply maintenance and software configuration management techniques to tackle change in the requirements.

Course Outcomes
After the completion of this course, students will be able to:

1.	Explain process models and their suitable applications for creating and maintaining software in different development environment.
2.	Apply project management tools and techniques for planning and managing software projects.
3.	Choose a suitable requirement engineering process and design approach to apply them for efficient coding of software.
4.	Evaluate and develop the software using various testing methods.
5.	Use techniques and principles of quality management and software change management.

Syllabus

MODULE – I

Introduction: Some Definitions, FAQs about software engineering, the evolving role of software, Software characteristics, SW applications

Software Processes: Software process models, Waterfall model, the prototyping model, spiral model, RAD , Incremental model and Agile Models

MODULE – II

Project Management: Management activities, Project planning, Project scheduling, Risk Management.SW cost estimation: Estimation techniques, Algorithmic cost modeling, Project duration and staffing

MODULE – III

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, the software requirements document. IEEE standard of SRS, Quality of good SRS. Requirement Engineering Process:Feasibility study, Requirements elicitation and analysis, Requirements validation, Requirement management.

MODULE – IV

Software Design: Design Concepts and Principles, Architectural Design, Object oriented Design, User interface design

UML: Class diagram, Sequence diagram, Collaboration diagram

MODULE – V

Verification and Validation: Verification and Validation Planning, S/W inspection, static analysis.

Software Testing : Testing functions, Test case design, White Box testing, Black box testing, Unit testing, Integration Testing, System testing, Reliability.

Text Book:

1. Sommerville : Software Engineering, Pearson Education Publication, 7th ed.

Reference Books:

1. R1: R. S. Pressman: Software Engineering: A Practitioners Approach, 5th Edn., TMA, New Delhi.
2. R2: J. F. Peters & W. Pedrycz– Software Engineering, John Wiley & Sons,Inc. 2000
3. R3: A.Behforooz & F.J. Hudson – Software Engineering Fundamentals, Oxford Univ. Press, New York, 2000.
4. R4: R.Mall: Fundamentals of Software Engineering. Prentice Hall, 3rd Edn, 2004
5. R5: Naresh Chauhan: Software Testing,Oxford Univ.Press,
6. R6: Presentations used in the course

Portion for Mid-semester Examination:

Modules: I, II &III (Spread in 6 questions each of 5 marks).

The Final Examination is comprehensive of the entire course.

Assignment will be given individually or in small group.

Minimum 75% of attendance is must

Gaps in the syllabus (to meet Industry/Profession requirements): Use of open source software testing tools

POs met through Gaps in the Syllabus: All POs

Topics beyond syllabus/Advanced topics/Design: Use of open source software testing tools

POs met through Topics beyond syllabus/Advanced topics/Design: All POs

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	10 x 2
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Mapping between COs and Course Delivery (CD) methods:

CD	Course Delivery methods	Course Outcome	Course Delivery Method
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1	CD_1 , CD_2

CD2	Tutorials/Assignments	CO2	CD_1,CD_2
CD3	Seminars	CO3	CD_1, CD_2
CD4	Mini projects/Projects	CO4	CD_1, CD_2, CD_5,CD_8
CD5	Laboratory experiments/teaching aids	CO5	CD_1, CD_2, CD_5
CD6	Industrial/guest lectures		
CD7	Industrial visits/in-plant training		
CD8	Self- learning such as use of NPTEL materials and internets		
CD9	Simulation		

Mapping between Course Objectives and Course Outcomes: IT361

Course Outcome	Course Objectives			
	A	B	C	D
1	H	H	M	M
2	H	H	L	L
3	H	H	M	H
4	H	M	H	L
5	H	M	L	H

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes									
	a	b	c	d	e	f	g	h	i	j
1	H	H	H	H	H	H	L	L	L	L
2	H	H	H	H	H	H	L	L	H	L
3	H	H	H	H	H	L	L	L	L	H
4	H	H	H	H	H	H	L	H	L	L
5	H	H	H	M	H	L	H	H	L	M

COURSE INFORMATION SHEET

Course title: Operating System Concepts
Pre-requisite(s): Data Structure, Computer System Architecture, Basic Course on ComputerProgramming
Co- requisite(s): None
Credits: L:3 T:0 P:0
Class schedule per week:3
Class: B.Tech
Semester / Level:V
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Present the main components of OS and their working
2.	Introduce the concepts of process and thread and their scheduling policies
3.	Handling synchronization of concurrent processes and deadlocks
4.	Analyze the different techniques for managing memory, I/O, disk and files
5.	Design the components of operating system

Course Outcomes
After the completion of the course student will be able to:

1.	Describe the main components of OS and their working
2.	Explain the concepts of process and thread and their scheduling policies
3.	Solve synchronization and deadlock issues
4.	Compare the different techniques for managing memory, I/O, disk and files
5.	Design components of operating system

Syllabus

Module I **[8L]**

Operating system Overview

Operating system Objective and Functions, Evolution of Operating System, Major Advances in OS Components, Characteristics of Modern Operating Systems

Process Description and Control

Process Concept, Process States, Process Description, Process Control, Threads, Types of Threads, Multicore and Multithreading

Module II **[8L]**

Scheduling

Type of scheduling, Uniprocessor Scheduling, Multiprocessor Scheduling

Module III **[8L]**

Concurrency

Mutual Exclusion and Synchronization

Principle of Concurrency, Mutual Exclusion, Hardware Support, Semaphores, Monitors, Message Passing, Readers/Writers Problem

Deadlock and Starvation

Principle of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Dining Philosopher Problem

Module IV **[8L]**

Memory Management

Memory Management Requirements, Memory Partitioning, Paging, Segmentation

Virtual Memory

Hardware and Control Structures, Operating System Policies for Virtual Memory

Module V **[8L]**

I/O Management and Disk Scheduling

I/O device, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling, RAID, Disk Cache

File Management

Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, File Allocation and Free Space Management

Text Book:

1. StallingsW., Operating systems - Internals and Design Principles, , 8th Edition, Pearson, 2014.

Reference Books:

1. SilberchatzAbraham, Galvin Peter B.,Gagne Greg, Operating System Principles, 9th Edition, Wiley Student Edition, 2013.
2. Tanenbaum Andrew S., Modern Operating Systems, 4th Edition, Pearson, 2014.
3. Dhamdhere D. M. ,Operating Systems A concept - based Approach, 3rd Edition, McGrawHill Education, 2017.
4. Stuart B. L., Principles of Operating Systems, 1st Edition, 2008, Cengage learning, India Edition.

5. Godbole A. S., Operating Systems, 3rd Edition, McGrawHill Education, 2017
   Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	2	2	1	1	2	1	1	1	1	2	2	2	1
CO2	2	2	2	2	1	1	2	1	1	1	1	2	2	2	1
CO3	2	2	3	2	2	2	2	2	1	2	1	3	3	2	2
CO4	3	3	3	3	2	2	2	2	2	2	2	3	3	3	3
CO5	3	2	2	2	2	3	1	1	1	1	1	1	3	3	1

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

Program Outcome

This course enables the students to:

1.	An ability to apply knowledge of mathematics, science and engineering to both software and hardware design problems.
2.	An ability to design and conduct experiments and to analyze and interpret data related to software and hardware design solutions.
3.	An ability to design a system, component or process to meet desired needs within realistic constraints.
4.	An ability to function on multidisciplinary teams using current computer engineering tools and technologies.
5.	An ability to identify, formulate and solve engineering problems based on a fundamental understanding of concepts of computer engineering topics.

Course Outcomes

After the completion of this course, students will be to:

1.	Analyze the principles and approaches of artificial intelligence
2.	Apply different search techniques for solving real world problems and select the most appropriate solution by comparative evaluation.
3.	Analyze the various concepts of knowledge representations and demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
4.	Develop knowledge-based systems using AI technology
5.	Implement AI systems dealing with inconsistencies

Syllabus

Module I

Introduction: Overview of Artificial Intelligence- Problems of AI, AI Technique, Tic - Tac - Toe Problem, Defining a Problem as State Space Search, Production System, Problem Characteristics, Issues in the Design of Search Programs.
(9L)

Module II

Search Techniques: Solving Problems by Searching, Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bi-directional Search, Comparing Uniform Search Strategies.
Heuristic Search Strategies: Greedy Best-First Search, A* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search, Local Beam Search, Genetic Algorithms; Constraint Satisfaction Problems. (9L)

Module III

Knowledge Representations: Knowledge Representation Issues, Representing Simple Fact in Logic, FOPL, Clausal Form, Resolution principle, Semantic Net, associative Network, Frames and Scripts.
(8L)

Module IV

Representing Knowledge Using Rules: Procedural Verses Declarative Knowledge, Logic Programming, Forward Verses Backward Reasoning, Matching, Control Knowledge and matching.
(7L)

Module V

Dealing with Inconstancies: Non-monotonic reasoning, TMS, Representing Knowledge in an Uncertain Domain, Bayesian Networks, Dempster-Shafer Theory.
Expert Systems: Basic components of ES, Expert System shell, Some example expert systems.
(7L)

Text Books:

Rich E. & Knight K., Artificial Intelligence, 3rd edition, TMH, New Delhi.(T2)
Russel S. and Norvig P., Artificial Intelligence a Modern Approach, 3rd edition, Pearson Education.(T1)

Reference books:

Patterson Dan W., Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.(R1)
Rolston D.W., Principles of AI & Expert System Development, TMH, New Delhi.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50

Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment					
Semester End Examination					

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	3	2	1	1	1	2	1	3	2	3	2
CO2	3	2	2	3	3	2	1	1	3	3	2	3	2	2	1
CO3	3	2	2	2	3	2	2	2	3	3	1	3	2	3	2
CO4	2	3	2	2	2	3	2	1	3	3	1	3	2	2	3
CO5	3	3	2	3	2	3	2	2	2	1	2	2	2	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT363
Course title: **Cryptography and Network Security**
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: VI
Branch: CSE/IT

Course Objectives

1.	To Learn Basic Concepts of Cryptography and Network Security and Apply them invarious Real life Application.
2.	To understand the basic concepts of Network Security
3.	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
4.	To understand how to deploy encryption techniques to secure data in transit across data networks
5.	To design security applications in the field of Information technology

Course Outcomes

After the completion of this course, students will be:

1.	Understand the basic concept of Cryptography and Network Security and their mathematical models, and to be familiar with different types of threats
2.	Learning and applying various Ciphering Techniques.
3.	Apply Symmetric and Asymmetric Cryptographic Algorithms and Standards in Networks.
4.	Examine the issues and structure of Authentication Service and Electronic Mail Security
5.	To explain and classify different malicious programs, worms and viruses, and to learn the working and design principles of Firewalls

Module I

Introduction to Cryptography: ComputerSecurity concepts, The OSI Security Architecture, Security Attacks, Security Services, A model for Network Security, Classical Encryption Techniques.

(8L)

Module II

Mathematical Foundations of Cryptography: Modular Arithmetic, Euclidean Algorithm, Groups, Rings, Fields, Finite Fields of the Form GF(p), Polynomial Arithmetic, Finite Fields of the Form GF(2^n), Prime Numbers, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Quadratic Congruence, Discrete Logarithms.

(8L)

Module III

Symmetric and Asymmetric Cryptography: Difference Between Symmetric and Asymmetric Cryptography, DES, Triple DES, AES, RSA Cryptosystem, Symmetric and Asymmetric Key Cryptography Together, Elgamal Cryptosystem, Elliptic Curve Cryptosystems, , Diffie-Hellman Key Exchange , Cryptographic Hash Functions, Message Authentication Codes, Digital Signature. (8L)

Module IV

Internet Security Protocols : Basic Concepts, Security Socket Layer (SSL), Secure Hyper Text Transfer Protocol (SHTTP), Time stamping Protocol(TSP), Secure Electronic Transaction(SET), SSL Versus SET, 3-D Secure Protocol, Electronic Money, Email Security, Wireless Application Protocol(WAP) Security, Security in GSM. (8L)

Module V

Network Security: Users, Trusts and Trusted Systems, Buffer Overflow and Malicious Software, Malicious Programs, Worms, Viruses, Intrusion Detection Systems (IDS), Firewalls: Definitions, Constructions and Working Principles. (8L)

Text Book:

Forouzan B. A., Mukhopadhyay D., "Cryptography and Network Security", 3rd Edition, Mcgraw Higher Education, 2016. (T1)

Reference Books:

Stallings W., "Cryptography and Network Security: Principles and Practice", 7th Edition, Pearson, 2017.(R1)

Kahate A., "Crptography and Network Security", 3rd Edition, McGraw Hill Education, New Delhi, 2013.(R2)

Schneier B., "Applied Cryptogaphy: Protocols, Algorithms And Source Code In C", 2nd Edition, Wiley, 2007. (R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcome onto Program Outcome

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	3	3	3	2	2	1	2	2	2	3	1
CO2	3	3	3	3	3	3	3	2	2	2	1	2	1	2	3
CO3	3	2	3	3	3	2	2	2	2	2	2	2	2	3	3
CO4	3	2	3	3	2	2	1	2	2	2	2	2	1	2	3
CO5	3	2	3	3	1	2	2	2	2	1	1	2	2	1	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course Code: IT461
Course Title: Data Mining Concepts
Pre-requisite(s): Data Base Management System
Co- requisite(s): NIL
Credits: L:3 T:0 P:3
Class schedule per week: 3
Class: B.Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To Examine the types of the data to be mined and apply pre-processing methods on raw data.
2	To introduce the basic concepts of Data Warehouse and Data Mining techniques.
3.	To apply the association rule mining algorithm to find interesting rules.
4.	To implement data mining techniques on different data sets for prediction and classification algorithms
5.	To apply clustering approach on various data sets and detecting outliers.

Course Outcomes
After the completion of this course, students will be able to:

1.	Illustrate the fundamentals of data mining systems as well as issues related to access and retrieval of data at scale.
2.	Analyze and choose different approaches of a data mining task.
3.	Apply the various data mining techniques to solve classification, clustering and association rule mining problems.
4.	Design and evaluate data mining models to be used in solving real life problems, keeping in view social impacts of data mining.
5.	Prepare themselves to investigate in the area of data mining and related applications that would enhance their problem solving skills.

Syllabus

Module I
Introduction to Data Mining, Data Mining functionalities, Data Mining primitives, major issues in data mining, Data Pre-processing, Descriptive data summarization, Data cleaning, Data integration and transformation, Data reduction, Data discretization and Concept hierarchy generation.

Module II
Data Warehouse, Multidimensional Data Model, schemas: Star, Snowflakes, Fact Constellations, Three Tier Data Warehouse architecture, Backend tools and utility, Types of OLAP servers: ROLAP, MOLAP, HOLAP.

Module III
Mining Frequent Pattern: Basic concepts, interesting rules, Association Rules, Mining Frequent item using candidate generation: Apriori Algorithm, Mining Frequent item without candidate generation: F-P Growth, Association Mining to Correlation analysis,

Module IV
Introduction to Classification and Prediction, Issues regarding classification and prediction, Linear Regression, Classification by Decision Tree Induction, Bayesian Classification, k-Nearest Neighbor Classification, Classification Accuracy and Error.

Module V
Cluster Analysis, Types of data in cluster analysis, Partitioning clustering methods: K-Means, K-Medoids, CLARANS, Hierarchical clustering methods: Agglomerative and Divisive clustering, BIRCH, Density based clustering method: DBSCAN, Introduction to outlier analysis and examples.

Text Book:

7. Jain Pai, Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques, 3rd Edition, Elsevier India Private Limited, 2015.

Reference Book:

8. Mohammed J. Zaki, and Wagner Meira Jr., “Data Mining and Analysis: Fundamental Concepts and Algorithms”, Cambridge University Press, 2016.
9. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, “Introduction to Data Mining”, Pearson India, 2014

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20(10x2)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars.
CD4	Mini Project.
CD5	Laboratory experiments/Teaching aids/Seminars.
CD6	Simulation
CD7	Self-Learning such as use of NPTEL, Course Era materials,

Mapping of Course Outcomes onto Program Outcomes

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	3	2	2	2	1	2	2	1	1	3	3	1
CO2	2	3	2	3	2	2	1	2	2	2	2	1	2	2	2
CO3	2	3	3	3	3	3	3	2	3	2	3	1	2	2	3
CO4	3	2	2	3	3	2	2	1	3	2	2	2	3	3	2
CO5	3	3	3	3	2	2	2	1	3	3	3	2	3	3	3

Mapping Between Course Outcomes And Course Delivery Method

Course Outcomes	Course Delivery Method
CO1	
CO2	
CO3	
CO4	
CO5	

COURSE INFORMATION SHEET

Course code: CS461
Course title: Fundamentals of Machine Learning
Pre-requisite(s):
Co- requisite(s):
Credits:3 L:3 T:0 P:0
Class schedule per week: 03
Class: B. Tech
Semester / Level: OE
Branch:

Course Objectives
This course enables the students:

1.	To understand the basic concepts of Machine Learning
2.	To provide the knowledge on the application of machine learning.
3.	To understand and utilize the concept of supervised learning in problem solving.
4.	To understand and utilize the concept of unsupervised learning in problem solving.
5.	To learn the utility of clustering techniques.

Course Outcomes
After the completion of this course, students will be able to:

1.	Formulate machine learning problems corresponding to different applications.
2.	Demonstrate understanding of a range of machine learning algorithms along with their strength and weakness.
3.	Implement machine learning solutions to classification and regression problem.
4.	Design and implement various machine learning algorithms in a range of real world applications.
5.	Evaluate and analyze the performance of machine learning algorithms based on machine learning.

Syllabus

Module I **[8 L]**

Introduction to Machine Learning: Introduction, Linear Algebra, Types of Machine Learning: Supervised Learning; Unsupervised Learning; Semi-Supervised Learning; Reinforcement Learning, Hypothesis Formulation and Model Selection.

Phases of ML: Training, Testing and Validation-Splitting, Cross Validation;

Module II **[8 L]**

Evaluation of Machine Learning Models: Error Analysis, Performance Indices, Confusion Matrices, The Bias-Variance Trade-off.

Regression: Linear Regression, Linear Regression with Multiple Variables, Coefficient of Determination.

Decision Trees: Introduction, Constructing Decision Trees, Attribute selection for splitting, CART.

Module III **[8 L]**

Graphical Models: Bayes' Theorem, Bayesian Learning, Bayesian Networks, NaïveBayes Classifier.

Instance based learning: Introduction to KNN algorithm; Decision boundary KNN Vs Decision tree; What is the best K; KNN Problems; Feature selection using KNNs.

Module IV **[8 L]**

Artificial Neural Network: Perceptron Algorithm; Decision Boundary for a single Neuron; The Multilayer Perceptron (MLP), Error Propagation, Delta Rule, Back Propagation Algorithm.

Introduction to Deep Learning: Convolutional Neural Networks (CNN), Applications.

Module V **[8 L]**

Clustering: Similarity and Distance Measures, K-Means Algorithm, Hierarchical Clustering, Clustering of Categorical Attributes;

Ensemble Learning: Boosting, Bagging, Stacking.

Text Books:

1. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", (Chapman & Hall/CRC Machine Learning & Pattern Recognition).
2. Tom M. Mitchell, "Machine Learning ", Tata McGraw Hill, New Delhi, 2017

Reference Books:

1. Shalev-Shwartz Shai and Ben-David Shai, Understanding Machine Learning, Cambridge University Press, 2017.
2. Bishop Christopher, Pattern Recognition and Machine Learning, Springer.

COURSE INFORMATION SHEET

Course code:IT263
Course title: **Object Oriented Programming and Design Pattern**
Pre-requisite(s): NIL
Co- requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level:
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	The course shall allow students to understand the basic tenets of OOP.
2.	The course will exemplify the basic syntax and constructs of JAVA.
3.	The course will help students understand the application OOP principles in various use cases.
4.	The course will explain basic JAVA GUI components and their working.
5.	The course aims to expose students to newer JAVA constructs like NIO, Lambdas etc.

Course Outcomes
After the completion of this course, students will be:

1.	Identify the difference between procedural and OO programming.
2.	Construct programs using various OOP principles.
3.	Design UI using JAVA GUI components.
4.	Operate on files and strings in real life scenarios.
5.	Analyze thread performance and inter thread communication issues

SYLLABUS

Module I

Introduction to Classes, Objects and Java

Introduction to Object Technology, Java, Understanding the Java development environment, Programming in Java, Memory concepts, Doing basic Arithmetic, Comparing entities, Classes, Objects, Methods, Strings, Primitive vs reference types.

(8L)

Module II

Control Statements, Methods and Arrays

Basic selection statements, Iterative constructs, Relative and Logical operators, break, continue, Methods, static methods, parameter passing, argument promotion and casting, scopes, method overloading. Arrays and ArrayList in Java, Enhanced for statement, Passing arrays to methods, Multidimensional arrays, Using command line arguments.

(8L)

Module III

Object Oriented Concepts: Polymorphism & Inheritance

Controlling access to class members, the use of this keyword, getters and setters, Composition, enum, the use of static and final, Garbage collection. Superclass and subclass, protected members, constructors in subclass, the Object class, Introduction to polymorphism, Abstract classes and methods, Assignment between subclass and superclass variables, Creating and using interfaces.

(8L)

Module IV

Exception Handling & GUI Design

When to use exception handling, Java exception hierarchy, finally block, Stack unwinding, Chained exceptions, Declaring new exception types, Assertions, try with resources. Simple I/O with GUI, Basic GUI Components, GUI Event handling, Adapter classes, Layout managers, Using panels. (8L)

Module V
Strings, characters & Files
Working with the String and StringBuilder class, Character class, Tokenizing strings, Regular Expressions, Files and Streams, Using NIO classes, Sequential file handling, Object serialization, JFileChooser, Introduction to threading, Introduction to Generics and lambda expressions.
(8L)

Text book:
Deitel P., Deitel H., Java How to Program, 10th Edition, Pearson Publications, 2016.(T1)

Reference book:
Wu C. T., Object Oriented Programming in Java, 5th Edition, McGrawHill Publications, 2010.(R1)

<u>Gaps in the syllabus (to meet Industry/Profession requirements): N/A</u>

<u>POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment</u>

<u>Topics beyond syllabus/Advanced topics/Design: Teaching through paper</u>

<u>POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper</u>

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment tool	**% contribution during co assessment**
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO2	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO3	2	1	3	3	3	3	2	1	1	1	1	2	3	2	3
CO4	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3
CO5	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course Code: CS263
Course Title: Data Structures and Algorithms
Pre-requisite(s): Programming for Problem Solving
Co- requisite(s): Data Structure and Algorithm Lab
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B. Tech (Minor)
Semester / Level: II/2
Branch: MINOR (CSE/IT)

Course Objectives
This course enables the students:

1.	It helps to understand the various data structures, their organization and operations.
2	It helps to assess the applicability of different data structures and associated algorithms for solving real world problem which involves comparing and select suitable data structures to solve the problem resourcefully.
3.	It introduces concepts for data organization and manipulation using data structures such as stacks, queues, linked lists, binary trees, heaps and graphs for designing their own data structures.
4.	To improve the logical ability.
5.	It helps to solve practical application problems in various fields of Computer Science.

Course Outcomes
After the completion of this course, students will be able to:

1.	Understanding the fundamental analysis and time complexity for a given problem.
2.	Articulate linear data structures and identify legal operations permitted on them for solving a computational problem.
3.	Articulate non-linear data structures and identify legal operations permitted on them for solving a computational problem.
4.	Select an appropriate sorting and searching algorithms to be used in specific circumstances and Understanding Graph algorithms, their operations and its applications to represent a data item to be processed.

5.	Design and implement Data Structures for solving real world problems efficiently.

Syllabus

Module I ***Fundamentals of Algorithms and its Analysis***

Introduction to algorithms and data structures, Time and Space analysis of an Algorithms, Types of asymptotic notations and orders of growth, Algorithm efficiency – best case, worst case, average case, Analysis of non-recursive and recursive algorithms, Basic ideas about asymptotic analysis for recurrence relation-Recursion Tree Method**.** **[8 Lectures]**

Module II ***Array, Stack and Queues***

Fundamentals of array 1D and 2D, Stack: Introduction and its basic operations (Push Pop, Peek), Applications of stack: Expression Evaluation, Conversion of Infix to postfix and prefix expression, Queues: liner queue, Circular queue, Dequeue, Priority queue and its representation using array.

[8 Lectures]

Module III ***Linked List***

Self-Referential Structures, Dynamic Memory Allocation, Singly Linked List-Operations on Linked List, Doubly Linked List, Circular Linked List, Stacks and Queues using Linked List, Applications -Polynomial Manipulation - Josephus problem (permutation), Polynomial representation using Linked List. ***[8 Lectures]***

Module IV ***Trees and Graph***

Tree - Terminology, Binary Tree: Terminology and Properties, Tree Traversals, Expression Trees, Binary Search Trees, Binary Search Tree operations, Graph – basic definition and Terminology, Representation of Graph, Graph Traversal: Breadth First Search (BFS), Depth First Search (DFS), Minimum Spanning Tree: Prim's, Kruskal's, Single Source Shortest Path: Dijkstra’s Algorithm

[8 Lectures]

Module V ***Searching and Sorting***

Searching: Introduction, Linear Search, Binary Search, Interpolation Search, Sorting: Bubble sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Heap Sort, Analysis. [8 Lectures]

Text Book:

1. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms , Third edition, MIT Press.
2. Mark A. Weiss, Data Structures & Algorithm Analysis in C++, 3rd edition, PEARSON

Reference Book:

1. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, Universities Press, Fundamentals of Data Structures in C.
2. Tremblay J. P. and P. G. Sorenson, Introduction to Data Structures with Applications, Tata McGraw Hill.
3. Kurt Mehlhorn, and Peter Sanders – Algorithms and Data Sturctures The Basic Toolbox, Springer-Verlag Berlin Heidelberg.
4. Samanta D., Classic Data Structures, Prentice Hall India.

Gaps in the syllabus (to meet Industry/Profession requirements): **Not Applicable**

POs met through Gaps in the Syllabus: : P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	First Quiz: 10 Mid Semester Examination: 25 Second Quiz: 10 Teacher's Assessment: 5
Semester End Examination	End Semester Examination: 50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25% (Mid Semester Examination: 25)
Two quizzes	20% (Quiz-1 + Quiz-2)
Teacher's Assessment	5% (Attendance: 5)

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty

2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1
CO2	2	2	1	1	1	1	1	1	1	1	1	2	2	2	1
CO3	3	3	3	1	2	1	1	1	1	1	1	2	2	3	1
CO4	3	3	2	2	2	1	2	2	1	1	1	2	3	3	2
CO5	2	2	3	2	3	1	1	2	2	1	2	3	3	3	2

Mapping Between Course Outcomes And Course Delivery Method

Course Outcomes	Course Delivery Method
CO1	CD1, CD6
CO2	CD1, CD2, CD3, CD6, CD7
CO3	CD1, CD2, CD3, CD6, CD7
CO4	CD1, CD2, CD3, CD4, CD6, CD7
CO5	CD1, CD2, CD3, CD4, CD5, CD6, CD7

COURSE INFORMATION SHEET

Course code: CS265
Course title: **Database Management System Concepts**
Pre-requisite(s): Data Structures.
Co- requisite(s):
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	Understand the fundamental concepts, historical perspectives, current trends, structures, operations and functions of different components of databases.
2.	Recognize the importance of database analysis and design in the implementation of any database application.
3.	Describe the role of transaction processing in a database system.
4.	Understand various concurrency control mechanisms for a database system.
5.	Describe the roles of recovery and security in a database system.

Course Outcomes

After the completion of this course, students will be able to:

1.	Analyze data organization requirements and their inter relationships.
2.	Illustrate the features of data models and their application for storing data.
3.	Design queries to maintain and retrieve useful information from the databases created.
4.	Analyze the physical database design with respect to their expected performance using normalization.
5.	Examine the best practices according to concepts of indexing, transaction control and concurrency maintenance

Syllabus

Module I

Database Design and Entity - Relational Model

Purpose of Database System; View of Data, Database Languages, Transaction Management, Database architecture, Database Users and Administrator, Types of database System, Overview of design process, E-R model, Constraints, E–R Diagram, E-R Diagram issues, Weak Entity Sets, Extended E – R Features, Reduction to E–R Schemas. (8L)

Module II

Relational Model and Query Languages

Structure of Relational Database, Codd's Rules, Fundamental Relational Algebra Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations, Data definition, Basic structure of SQL queries, Set Operations, Aggregate Functions, Null Values, Nested Sub Queries, complex queries, views, modification of database, Joined relations, SQL data types & schemas, Integrity constraints, authorization, Embedded SQL, Triggers. (8L)

Module III

Relational Database Design

Functional dependency, Decomposition, Normalization, First normal form, Second normal form, Third normal form, BCNF, Multivalued dependencies and Fourth normal form, Join dependencies and Fifth normal form, DKNF. (8L)

Module IV

Transaction Processing Concepts

Introduction to Transaction processing, Transaction and system concepts, Desirable properties of Transaction, Schedules and recoverability, serializability of schedules, Transaction support in SQL.

(8L)

Module V

Concurrency Control and Recovery

Locking techniques for concurrency control, Concurrency control based on Timestamp ordering, Multiversion concurrency control techniques, Recovery concepts, Recovery techniques based on Deferred update & Immediate update, Shadow paging, Recovery in Multidatabase systems. (8L)

Text Book:

Silberschatz A. et.al, Database System Concepts, 6th Edition, Tata Mc-Graw Hill, New Delhi, 2011. (T1)

Reference Books:

Elmasri R., Fundamentals of Database Systems, 7thEdition, Pearson Education, New Delhi, 2016. (R1)

Ullman Jeffrey D et.al., A First course in Database Systems, 3rd Edition, Pearson Education, New Delhi- 2014.(R2)

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u><u>N/A</u>

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training

CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO2	3	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO3	3	1	3	3	3	3	2	1	1	2	1	2	3	2	3
CO4	3	1	3	3	3	3	2	1	1	2	2	3	3	2	3
CO5	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT365
Course title: Data Communication & Networking
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B. Tech
Semester / Level: III
Branch: CSE/IT
Course Objectives:

This course enables the students to:

1.	Study the components of the data communication model and communications architecture.
2.	Understand the differences and similarities between the OSI model and the TCP model.
3.	Understand the fundamentals of the theory of signalling.
4.	Understand the basic principles of signal encoding techniques, error-detection, and error-correction techniques.
5.	Understand the characteristics of analog signaling and digital signaling and the strengths and weaknesses of each method.

Course Outcomes:

After the completion of this course, students will be able to:

1.	Identify the elements of a communication network.
2.	Illustrate different data communications and networking standards.
3.	Design and implement a simple LAN and a WAN that meet a specific set of criteria.
4.	Identify the new trends and technologies, their potential applications.
5.	Examine the social impact of the networking technology particularly on issues related to security and privacy.

Syllabus

Module I

Data Communications and Networking Overview

A Communications Model, Data Communications, Data Communication Networking, The Need for Protocol Architecture, A Simple Protocol Architecture, OSI, The TCP/IP Protocol Architecture, Data Transmission Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity. (8L)

Module II

Transmission Media and Signal Encoding Techniques: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission. Digital Data Digital Signals, Digital Data Analog Signals, Analog Data Digital Signals, Analog Data Analog Signals. (8L)

Module III

Digital Data Communication Techniques and Data Link Control:

Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error correction, Line Configurations, Interfacing, Flow Control, Error Control, High-Level Data Link Control (HDLC).

(8L)

Module IV

Multiplexing, Circuit Switching and Packet Switching Multiplexing

Frequency Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing, Switching Networks, Circuit-Switching Networks, Circuit-Switching Concepts, Control Signaling, Soft switch Architecture, Packet-Switching Principles, X.25, and Frame Relay. (8L)

Module V

Asynchronous Transfer Model

Protocol Architecture, ATM Logical Connections, ATM Cells, Transmission of ATM Cells, ATM Service Categories, ATM Adaptation Layer.

Routing in Switched Networks

Routing in Circuit-Switching Networks, Routing in Packet-Switching Networks, Least-Cost Algorithms. (8L)

Text Book:

Stallings W., Data and Computer Communications, 10thEdn., Pearson Education, PHI, New Delhi, 2014.(T1)

Reference Book:

Forouzan B. A., Data Communications and Networking, 5thEdn. TMH, New Delhi, 2017.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

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CO2	3	2	2	2	2	1	1		2	2	2	3	3	3	3
CO3	3	3	2	2	2	2	1		2	3	2	3	3	3	3
CO4	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3
CO5	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3

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