SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

Sree Sainath Nagar, Tirupati

Department of Computer Science and Systems Engineering

Supporting Document for 1.1.2

Syllabus Revision carried out in 2019

Program: B.Tech.- Computer Science and Systems Engineering

Regulations : SVEC-19

This document details the following:

1. Courses where syllabus has been changed 20% and more.
2. Course-wise revised syllabus with changes highlighted.

Note: *For SVEC-19 revised syllabus, SVEC-16 (previous syllabus) is the reference.*

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List of Courses where syllabus content has been changed (20% and more)

S. No.	Course Code	Name of the course	Percentage of Content changed	Page Number in which Details are Highlighted
1.	19BT21501	Object Oriented Programming Through Java	30	2
2.	19BT21531	Object Oriented Programming Through Java Lab	70	6
3.	19BT31501	Data Structures And Algorithms	40	12
4.	19BT31503	System Programming	100	16
5.	19BT31531	Data Structures And Algorithms Lab	50	20
6.	19BT31532	Operating Systems Lab	30	24
7.	19BT31533	Workshop In Computer Science And Systems	100	28
8.	19BT315AC	Design Thinking	100	31
9.	19BT41531	Design And Analysis Of Algorithms Lab	100	33
10.	19BT1AC01	Spoken English	100	35
11.	19BT1BS02	Biology For Engineers	100	37
12.	19BT1HS01	Communicative English	20	39
13.	1gBT1SS03	Engineering Pl'tyslcs	40	43
14.	19BT1BS31	Engineering Physics Lab	30	49
15.	19BT1BS04	Engineering Chemistry	50	53
16.	19BT1BS32	Engineering Chemistry Lab	25	59
17.	19BT2BS01	Transformation Techniques And Linear Algebra	20	63
18.	19BT4BS01	Material Science	100	68
19.	19BT4HS05	Gender &. Environment	100	71
20.	19BT4HS09	Life Skills	100	74
21.	19BT4HS11	Professional Ethics	100	76
22.	19BT4HS12	Women Empowerment	100	78
23.	19BT40107	Sustainable Engineering	100	80
24.	19BT10501	Programming For Problem Solving	37.7	83
25.	19BT10531	Programming For Problem Solving Lab	50	87
26.	19BT40532	Database Management Systems Lab	41	93
27.	19BT31202	Software Engineering	20	103
28.	19BT31232	Software Engineering Lab	100	108
29.	19BT10201	Basic Electrical And Electronics Engineering	100	111
30.	19BT10231	Basic Electrical And Electronics Engineering Lab	100	113
31.	19BT50409	Green Technologies	35	115
32.	19BT31202	Software Engineering	20	120
33.	19BT61201	Cloud Computing	60	125
34.	19BT71201	Data Analytics	100	129
35.	19BT51203	Advanced Databases	20	131
36.	19BT71205	Decision Support and Intelligent Systems	100	135
37.	19BT61041	Sensors and Applications	100	138
38.	19BT51501	Modern Cryptography	100	140
39.	19BT51502	Natural Language Processing	100	142
40.	19BT51503	Parallel Computer Architectures	100	144
41.	19BT51504	Performance Evaluation of Computer Systems	100	146

S. No.	Course Code	Name of the course	Percentage of Content changed	Page Number in which Details are Highlighted
42.	19BT51505	Software Testing	100	150
43.	19BT61501	Data Visualization Techniques	100	154
44.	19BT61502	Information Security	100	156
45.	19BT61503	Parallel and Distributed Systems	100	160
46.	19BT61505	Systems Reliability	100	162
47.	19BT61506	User Interface Design	100	164
48.	19BT71501	System Simulation and Modelling	100	166
49.	19BT71502	Computational Statistics	100	170
50.	19BT71503	Deep Learning	100	172
51.	19BT71504	High Performance Computing	100	174
52.	19BT715AC	Kernel Programming	100	178
53.	19BT61531	Internet of Things Lab	100	180
54.	19BT71531	System Simulation and Modelling Lab	100	181
55.	19BT50502	Artificial Intelligence	100	185
56.	19BT50503	Cyber Security	100	187
57.	19BT60502	Machine Learning	100	189
58.	19BT70501	Augmented Reality And Virtual Reality	100	191
59.	19BT70502	Data Science	100	193
60.	19BT70503	Block chain Technologies	100	195
61.	19BT60505	Soft Computing	100	197
62.	19BT51208	IoT Architecture and Protocols	100	199
63.	19BT60402	Micro Controllers	100	201
64.	19BT70412	Pattern Recognition	100	203
65.	19BT60318	Industrial Internet of Things	100	205
66.	19BT60314	Optimization Techniques	100	207
67.	19BT60531	Machine Learning Lab	100	209
		Average %**(A)**	81.9	-
		Total No. of Courses in the Program **(T)**	125	
		No. of Courses where syllabus (more than 20% content) has been changed **(N)**	67	
		Percentage of syllabus content change in the courses **(C)=(A x N)/100**	54.8	
		Percentage of Syllabus Content changed in the Program (P)= C/T*100	**43.89**	

DEAN (Academics)

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PRINCIPAL

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I B. Tech. – II Semester

(19BT21501) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

(Common to CSE, CSSE, IT, CSE (AI) and CSE (DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A course on Programming for Problem Solving

COURSE DESCRIPTION: Introduction to Object Oriented Programming, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Collection Classes; Applets, Swings, Event handling.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1: Demonstrate knowledge on object oriented programming constructs to solve programming problems.

CO2: Analyze object oriented programming features – polymorphism, inheritance, exception handling and multithreading for reusability.

CO3: Develop user interfaces using GUI programming techniques.

DETAILED SYLLABUS:

UNIT I : INTRODUCTION **(9 periods)**

Introduction to Object Oriented Programming, Java Buzzwords, History, Java Environment, Java Components, Programming Paradigms, Naming Conventions.

Classes and Objects: Introduction to classes, objects, Constructors, Garbage Collection, this keyword, Access Control, Features of Object Oriented Programming.

UNIT II: DATA TYPES, CONTROL STATEMENTS, POLYMORPHISM **(9 periods)**

Data Types, Variables, Type Conversions (Boxing and Unboxing/Wrapping and Unwrapping) and Casting, Arrays, Operators, Decision Making Statements, Looping Statements, Methods, Recursion, Method Overloading, Constructor Overloading, Parameter Passing, String Class, Final Keyword.

Utility Classes: String Tokenizer, Scanner, Random, Bit Set.

UNIT III : INHERITANCE, PACKAGES, INTERFACES **(9 periods)**

INHERITANCE: Introduction, Classification, Abstract Classes, Final keyword with Inheritance.

PACKAGES: Basics, Creating and Accessing a package, CLASSPATH, Importing packages.

INTERFACES: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT IV: EXCEPTION HANDLING, MULTITHREADING, COLLECTION FRAMEWORK **(9 periods)**

EXCEPTION HANDLING: Exception, Types of Exception, Keywords: try, catch, throw, throws and finally, Built-in Exceptions, User Defined Exceptions.

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MULTITHREADING: Process, Thread, Thread Model, Creating a thread, Priorities, Thread Synchronization, Inter-thread Communication.

COLLECTION FRAMEWORK: Framework Hierarchy, ArrayList, LinkedList, HashSet.

UNIT V – APPLETS, SWINGS, EVENT HANDLING **(9 periods)**

APPLET CLASS: Basics, Types, Architecture, Skeleton, Parameter passing to applets.

SWINGS: Introduction, Features, Hierarchy, Swing GUI Components, Packages in Swings, Swing Control Classes and Methods.

EVENT HANDLING: Event Classes, Event Listener Interfaces - Mouse and Key, Adapter Classes.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Herbert Schildt, *Java the Complete Reference*, 9th edition, Oracle Press, 2014.

REFERENCE BOOKS:

1. Sachin Malhotra and Saurab Choudhary, *Programming in Java*, 2nd edition, Oxford University press, 2014.
2. Y. Daniel Liang, *Introduction to Java Programming,* Pearson Education.
3. T. Budd, *Understanding Object-Oriented Programming with Java,* Pearson Education.

ADDITIONAL LEARNING RESOURCES

https://docs.oracle.com/javase/tutorial/index.html

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II B. Tech. – I Semester

(16BT41202) JAVA PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Object Oriented Programming through C++.

COURSE DESCRIPTION: Introduction of Java, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Event handling, AWT, Collection Classes; Applets, Servlets.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on:
- Object Oriented Programming concepts - classes, objects, inheritance, polymorphism, encapsulation and abstraction.
- Packages, interfaces, multithreading, exception handling, event handling.

CO2. Analyze complex engineering problems using object oriented concepts.

CO3. Design and develop reusable code to provide effective solutions for real world problems using inheritance and polymorphism.

CO4. Apply AWT and Applets to create interactive Graphical User Interfaces.

CO5. Use advanced programming languages to develop web applications.

CO6. Build Java Applications suitable for societal requirements.

DETAILED SYLLABUS:

UNIT I: INTRODUCTION (10 Periods)

Data types, Variables, Arrays, Operators, Control statements.

Classes and Objects: Concepts of Classes, Objects, Constructors, Methods, this keyword, Garbage collection, Overloading Methods and Constructors, Parameter passing, Access control, Recursion, String Class.

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UNIT II: INHERITANCE, PACKAGES AND INTERFACES (09 Periods)

Inheritance: Inheritance basics, Super keyword, Multi-level hierarchy, Abstract classes, Final keyword with inheritance.
Packages: Definition, Creating and accessing a package, Understanding CLASSPATH, Importing packages.
Interfaces: Definition, Implementing interfaces, Nested interfaces, Applying interfaces, Variables in interface and Extending interfaces.

UNIT III: EXCEPTION HANDLING AND MULTITHREADING (08 Periods)

Exception Handling: Concepts of exception handling, Exception types, Usage of Try, Catch, Throw, Throws and Finally, Built in exceptions, Creating own exception sub classes.
Multithreading: Java thread model, Creating threads, Thread priority, Synchronizing threads, Inter-thread communication.

UNIT IV: COLLECTION CLASSES, THE APPLET CLASS AND AWT (10 Periods)

Collection Classes: ArrayList Class, LinkedList Class, Hashset Class, LinkedHashSet Class, TreeSet Class, PriorityQueue Class, EnumSet Class.
The Applet Class: Types of applets, Applet basics, Applet architecture, Applet skeleton, Passing parameters to applets.
AWT Control Fundamentals: User interface components, Layout managers.

UNIT V: EVENT HANDLING AND SERVLETS (08 Periods)

Delegation event model: Event classes, Event Listener Interfaces – Mouse and Key; Adapter classes.
Servlets: Life cycle of a servlet, Using Tomcat for Servlet development, Create and compile the servlet source code, Servlet API, Javax.Servlet package.

Total Periods: 45

TEXT BOOK:

1. Herbert Schildt, *Java the Complete Reference*, Oracle Press, 9th Edition, 2014.

REFERENCE BOOK:

1. Sachin Malhotra and Saurab Choudhary, *Programming in Java*, Oxford University press, 2nd Edition, 2014.

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I B. Tech. – II Semester

(19BT21531) OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

(Common to CSE, CSSE, IT, CSE (AI) and CSE (DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	2	2

PRE-REQUISITES: A course on OOPS through Java.

COURSE DESCRIPTION: Hands-on experience on Polymorphism; Inheritance and Interfaces; Exception Handling; Multithreading; Event Handling; Applets, swings.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1: Apply syntactic constructs of the JAVA programming language to solve logic based problems

CO2: Develop application programs using concepts of object oriented programming.

CO3: Function effectively as an individual and on terms to solve problems with effective communication.

CO4: Write and prepare mini project reports/ documents effectively.

LIST OF EXERCISES:

1 Demonstrate the following programs using command line arguments:

- A Write a program that computes the sum of all its integer arguments
- B Write a program to input n integers and perform sorting between them.

2

- A The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 0, 1. Every subsequent value is the sum of the 2 values preceding it. Write a Java program that uses both recursive and non-recursive functions to print the nth value of the Fibonacci sequence?
- B Write a program to define a class student with name, registration number and marks for three subjects as instance variables and describe a constructor to initialize them. Also define a method display to print all the values.

3

- A Write a program to print the element of an array that has occurred highest number of times.
- B Write a program that displays a menu with options 1. Add 2. Sub. Based on the options chosen, read 2 numbers and perform the relevant operation. After performing the operation, the program should ask the user if he wants to continue. If the user presses y or Y, then the program should continue displaying the menu else the program should terminate. [Use Scanner class]

4

- A Write a Program to count tokens- number of words and characters in a string.
- B Write and test overloaded methods to find sum of three integers, sum of three double values and sum of four integers.

5

- A Write a program to create an abstract class named Shape that contains an empty method named numberOfSides ( ). Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method number Of Sides ( ) that shows the number of sides in the given geometrical figures.

	B	Write a program that imports the User-defined package P1 and access the member variables and methods of classes that contained in the package P1.
6		A University awards some grace marks to students who participate in the Inter University games. Therefore, total marks awarded = Exam_Marks +Sports_Grace_Marks. If total marks scored are greater than maximum marks, then the final marks awarded will be equal to the maximum marks. An Object Oriented based implementation will contain a class called Results, which extends a class called Exam, which itself extends a class called Student. It will also contain an interface called Sports, which is implemented by the Results class. The Results class will be responsible for computing the final marks scored by the students. Write a Java program along with an interactive driver class.
7	A	Write a program to handle Arithmetic Exception, Array Out Of Bounds Exception using try and multiple catch statements.
	B	Write a java program to throw a user defined exception called Negative, if the entered input is a negative number.
8	A	Write a Java program that creates three threads. First thread displays - Good Morning for every one second, the second thread displays - Hello for every two seconds and the third thread displays - Welcome for every three seconds.
	B	Write a Java program that correctly implements producer consumer problem using the concept of inter-thread communication.
9	A	Write a program create a class "Book" with name, id, author, publisher and quantity as instance variables and a constructor to initialize them. Create a HashSet object of type Book and three Book instances b1, b2 and b3. Add these instances into HashSet and display them.
	B	Develop an Applet that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named "Compute" is clicked.
10	A	Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.
	B	Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.
11		Write a java program that handles all mouse and key events and shows the event name at the center of the window when mouse event is fired (Use Adapter classes).

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REFERENCE BOOKS:

1. Herbert Schildt, *Java the Complete Reference*, Ninth Edition, Oracle Press, 2014.
2. Sachin Malhotra and Saurab Choudhary, *Programming in Java*, Second Edition, Oxford University Press, 2014.

SOFTWARES/Tools used:

Java SE 12.0.1

ADDITIONAL LEARNING RESOURCES

Problems to be considered from Hackerearth and CodeChef platforms

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II B. Tech. – I Semester

(16BT31231) JAVA PROGRAMMING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: A course on Java Programming.

COURSE DESCRIPTION: Hands on experience on Polymorphism; Inheritance and Interfaces; Exception Handling; Multithreading; Event Handling; AWT; Applets; Servlets.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on basic concepts of Java programming.
CO2. Design and develop efficient programs with multitasking ability and handle exceptions.
CO3. Demonstrate independent problem solving skills in developing interactive applications.
CO4. Apply object oriented approach to develop user friendly interface and learn how to communicate with systems over the network.
CO5. Build Java applications suitable for societal requirements.
CO6. Work effectively as an individual and as a member in team for case studies implementation.
CO7. Demonstrate communication skills, both oral and written for preparing and presenting reports.

LIST OF EXERCISES:

1. a. Write a Program to accept two integers through the command line arguments and print the sum of the two numbers.
   b. Write a Program to accept a String as a Command line argument and the program should print a Welcome message.
2. Write a program that displays a menu with options 1. Add 2. Sub. Based on the options chosen, read 2 numbers and perform the relevant operation. After performing the operation, the program should ask the user if he wants to continue. If the user presses y or Y, then the program should continue displaying the menu else the program should terminate.[Use Scanner class]

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3. a. Write a program to print the element of an array that has occurred highest number of time.
   b. 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.
4. a. Create a class "Amount In Words" to convert the amount into words. (Consider the amount to be not more than 100000.)
   b. Write a Program to count tokens- number of words and characters in a string.
5. Implement any one of the case study with the specifications given below:
   a) Create classes, objects and their properties.
   b) Add methods to classes and implement them.
   c) Refine the objects by adding constructors and local variables.
   d) Show communication between the objects by calling instance of one object from another class.
   e) Handle Exceptions and Implement relationships like inheritance.

Case study 1: Banking Application:
The banking application consists of five divisions. They are customer details, creating a new account, withdrawing money, loan details and depositing money. The customer details consist of customer name, address, phone number, account number. To withdraw money checks the balance in the account and then get the money. The loan details consist of loan types like home loans, car loans, education loans etc. To deposit money enter the account number and give the account to be deposited.

Case study 2: Library Application:
The Library Application consists of Student, faculty and book details, Issue book, and return book. The student and faculty details consist of name, ID, Branch and maximum number of books can be issued to them. The book details consist of ID, Book name and Author name. To Issue a book to members, the librarian checks the availability of book and if the book is not available, then an error message will be displayed. To return the book, the librarian verifies the validity and if the validity is expired then the fine amount message will be displayed. The student and faculty can view the book details issued to them and also can check the count of remaining books that can be taken for issue.

6. A. Write a program that correctly implements producer consumer problem using the concept of inter-thread communication.

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B. Write a program that demonstrates time slicing among equal priority threads, show that a lower priority thread's execution is deferred by the time slicing of higher-priority threads.

7. Develop an Applet that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named "Compute" is clicked.
8. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result.
9. Create a Servlet that recognizes first time visitor to web application and responds by saying "Welcome to new user" otherwise "welcome back".

REFERENCE BOOKS:

1. Herbert Schildt, *Java the Complete Reference*, Oracle Press, 9th Edition, 2014.
2. Sachin Malhotra and Saurab Choudhary, *Programming in Java*, Oxford University press 2nd Edition, 2014.

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II B. Tech. – I Semester

(19BT31501) DATA STRUCTURES AND ALGORITHMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES: A Course on "Object Oriented Programming"

COURSE DESCRIPTION:

Algorithm Analysis; Linked Lists; Stacks and Queues; Trees; Binary search trees; AVL trees; Heaps; Multiway search trees; Graphs; Sorting and Searching; Hashing

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

CO1: Understand the fundamental concepts of data structures, asymptotic notations and Algorithm analysis techniques to measure the performance of an algorithm.

CO2: Analyze performance of sorting and searching algorithms by making use of time and space complexity.

CO3: Design algorithms to solve societal problems by applying contextual knowledge on linked lists

CO4: Solve computational problems by using stacks and queues

CO5: Apply suitable data structure to perform operations on trees and graphs

CO6: Construct hash tables by using Hash functions and relevant collision resolution technique.

DETAILED SYLLABUS:

UNIT I– Introduction, Sorting and Searching **(11 periods)**

Introduction: Introduction to data structures, Introduction to Algorithm, Performance Analysis- Space Complexity, Time Complexity, Asymptotic Notation- Big Oh, Omega, Theta notations, Guidelines for Asymptotic Analysis, Algorithms Analysis: Problems & Solutions.

Sorting: Bubble Sort, Insertion sort, Selection Sort, Shell Sort, Radix sort and their performance analysis

Searching: Linear Search, Binary Search and their performance analysis

UNIT II – Linked List **(8 periods)**

Single Linked List, Circular Linked List, Double Linked List, Circular Double Linked List, Applications of Linked List- Sparse Matrix Representation and its performance analysis, Addition of Polynomials and its performance analysis

UNIT III – Stacks and Queues **(8 periods)**

Stacks: Introduction, Definition, Implementation of stacks using arrays, Implementation of stacks using linked list, Applications of Stacks

Queues: Introduction, Definition, Implementation of queues using arrays, Implementation of queues using linked list, Circular Queue, Deque, Priority Queue, Applications of Queues

UNIT IV – Trees, Search Trees and Heaps **(9 periods)**

Trees: Basic Terminologies, binary trees, Properties of binary tree, Representation of Binary Tree, Binary tree traversals.

Search Trees: Binary Search Trees, Operations on Binary Search Trees, AVL Trees and Operations on AVL trees

Heap: Heap Trees, Implementation of Heap Trees, Applications of Heap – Heap Sort and Its performance Analysis

UNIT V – Multi way Trees, Graphs and hashing **(9 periods)**

Multiway Trees: M-way search trees, B-trees, Operations on B-trees, B+-trees

Graphs: Introduction, Basic Terminologies, Representation of Graphs, Breadth First Search and its Complexity Analysis, Depth First Search and its Complexity Analysis

Hashing: Introduction, Hash Table Structure, Hash Functions, Linear Open Addressing, Chaining and their performance analysis.

Total Periods: *45*

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Debasis Samanta, Classic Data Structures, PHI Learning private limited, Second Edition, 2017
2. Narasimha Karumanchi, Data Structures and Algorithms made easy, Career Monk, 5th Edition, 2017

REFERENCE BOOKS:

1. G A V Pai, Data Structures and Algorithms: Concepts, Techniques and Applications,Mc graw Hill Edition
2. Satraj Sahani, Data Structures, Algorithms and Applications in Java, Universities Press, Second Edition, 2008
3. Michael T. Goodrich, Roberto Tamassia, Data Structures and Algorithms in java, Wiley India, Second Edition, 2007

ADDITIONAL LEARNING RESOURCES:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/lecture-videos
2. http://nptel.ac.in/courses/106106127/
3. http://www.nptel.ac.in/courses/106102064

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II B. Tech. – I Semester

(16BT30502) DATA STRUCTURES

(Common to CSE, IT and CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Programming in C

COURSE DESCRIPTION:
Linked Lists; Type of lists; Operations and Applications; Stacks and Queues; Operations and Applications; Trees, Search trees and Heaps; Multi-way Trees and Graphs; Searching and Hashing.

COURSE OUTCOMES:
On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on
- Principles of Data Structures.
- Linear and Non-linear Data Structures.
- Sorting and hashing techniques.

CO2. Analyze and Identify suitable data structure for computational problem solving.

CO3. Design solutions for complex engineering problems using linear and non-linear data structures.

CO4. Develop solutions for Complex computational problems by conducting explorative analysis.

CO5. Apply appropriate data structure to provide solutions for real time problems by using C Language.

CO6. Apply contextual knowledge of data structures to design applications for societal applications like payroll systems, web applications, banking and financial systems.

DETAILED SYLLABUS:

UNIT I: LINKED LISTS (08 Periods)
Pointers, Operations, Linked List definition, Single Linked Lists, Circular Linked List, Doubly Linked List, Circular Doubly Linked List, Application of Linked Lists.

UNIT II: STACKS AND QUEUES (08 Periods)
Stacks: Stack operations, Stack Linked List, Implementation, Stack applications.
Queues: Queue operations, Queue Linked List design, Queue applications.

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UNIT III: TREES, SEARCH TREES AND HEAPS (10 Periods)

Trees: Tree concepts, Binary Trees.
Binary Search Trees (BST): Basic concepts, BST operations, BST applications.
AVL Search Trees: Basic concepts, AVL Tree implementations.
Heaps: Basic concepts, Heap implementation, Heap applications.

UNIT IV: MULTIWAY TREES AND GRAPHS (10 Periods)

Multiway Trees: B-Trees, Simplified B-Trees, B-Tree variations.
Graphs: Basic concepts, Operations, Graph storage structures, Graph algorithms - Create graph, Insert vertex, Delete vertex, Retrieve vertex, Depth-first traversal, Breadth-first traversal.

UNIT V: SORTING AND HASHING (09 Periods)

Internal Sorting: Quick Sort, Shell Sort, Merge Sort, Heap Sort.
External Sorting: Introduction, External storage device and sorting with tapes, Balanced Merge.
Hashing: Introduction, Hash Table structure, Hash functions, Linear Open Addressing, Chaining, Applications.

Total Periods: 45

TEXT BOOKS:

1. Richard Gileberg and Behrouz A. Forouzan, *Data Structures: A Pseudo-code Approach with C*, Cengage Learning, 2nd Edition, 2007.
2. G.A.V. Pai, *Data Structures and Algorithms*, Tata McGraw Hill, 2nd Edition, 2009.

REFERENCE BOOKS:

1. Debasis Samanta, *Classic Data Structures,* PHI Learning, 2nd Edition, 2009.
2. Aaron M. Tenenbaum, Yedidyah Langsam, and Moshe J. Augenstein, *Data Structures Using C,* Pearson Education, 2005.

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II B. Tech. – I Semester

(19BT31503) SYSTEM PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:- -

COURSE DESCRIPTION: Synchronized I/O, Direct I/O, Buffered I/O, Scatter/Gather I/O, I/O Schedulers, Device Drivers, Kernel Modules, Debugging System

COURSE OUTCOMES:

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

CO1: Apply system programming APIs for performing operations on files.

CO2: Implement buffer through streams for interactive I/O management.

CO3: Analyze I/O performance using synchronous and asynchronous operations

CO4: Identify classes of device drivers and its security issues in kernel development

CO5: Build running modules for setting up a system using module parameters in the user space

CO6: Analyze different I/O operations and debugging techniques in the design of char drivers.

DETAILED SYLLABUS:

UNIT I: FILE I/O **(8 periods)**

Systems Programming, APIs, ABIs, Standards, Opening Files, Reading via read(),Writing with write(),Synchronized I/O, Direct I/O, Closing Files, Seeking with lseek(),Positional Reads and Writes, Truncating Files, Multiplexed I/O, Kernel Internals

UNIT II: BUFFERED I/O **(9 periods)**

User-Buffered I/O, Standard I/O, Opening Files, Opening a Stream via File Descriptor, Closing Streams, Reading from a Stream, Writing to a Stream, Sample Program Using Buffered I/O, Seeking a Stream, Flushing a Stream, Errors and End-of-File, Obtaining the Associated File Descriptor, Controlling the Buffering, Thread Safety, Critiques of Standard I/O

UNIT III: ADVANCED FILE I/O **(8 periods)**

Scatter/Gather I/O, The Event Poll Interface, Mapping Files into Memory, Advice for Normal File I/O, Synchronized, Synchronous, and Asynchronous Operations, I/O Schedulers and I/O Performance

UNIT IV:DEVICE DRIVERS AND RUNNING MODULES **(10 periods)**

The role of Device Driver, Splitting the kernel, Classes of Devices and Modules, Security Issues. Building and Running Modules: Kernel Modules versus Applications,The Kernel Symbol Table, Preliminaries, Initialization and shutdown, Doing it in user space.

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UNIT V: CHAR DRIVERS AND DEBUGGING TECHNIQUES **(10 periods)**

The Design of Scull, Some Important Data Structures, Char Device Registration, Open and Release, Scull's Memory Usage, Read and Write. Debugging Techniques: Debugging support in the Kernel, Debugging System faults, Debuggers and Related Tools.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Robert Love, Linux System Programming, O'Reilly Media, 2007.
2. Jonathan Corbet, Alessandro Rubini, Greg Kroah-Hartman, LINUX Device Drivers, O'Reilly Media, Year: 2005

REFERENCE BOOKS:

1. 1.Dayanand Ambawade, Deven Shah, "Linux Labs and Open Source Technologies", Dreamtech Press, 2014.
2. 2.Venkateswaran S, "Essential Linux Device Drivers", Pearson Education, 2008

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III B. Tech. - I Semester

(16BT51502) SYSTEMS SOFTWARE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Operating Systems.

COURSE DESCRIPTION:
Kernel and Shell; The shell interpretive cycle ; Shell scripts; System calls for the File System - Open, Read, Write, File and record locking ; Process states and transitions;Process Creation; TCP/IP Basics; Resolving IP Addresses, Maintaining Security.

COURSE OUTCOMES:
On successful completion of this course, students will be able to

CO1. Demonstrate knowledge on commands for text processing and Files.
CO2. Analyze and Interpret process and System management techniques used in System Software
CO3. Use inbuilt UNIX system APIs to control system and its process.
CO4. Apply algorithms to manipulate the process context in system Software.
CO5. Perform effective troubleshooting using system error defines available with the operating system.

DETAILED SYLLABUS:

UNIT I: UNIX ARCHITECTURE AND COMMAND USAGE (09 Periods)

Division of Labor : Kernel and Shell, The file and process, The System calls, Features of UNIX, Internal And External Commands, Command Structure, General-Purpose Utilities: cal, date, echo, printf, bc, script, Email Basics, mailx, passwd, who, uname, tty, sty.

Handling Files: The file, File Name, The parent-child relationship, The home variable, pwd, cd, mkdir, rmdir, ls, cat, cp, rm, mv, more, file, wc, od, cmp, comm, diff, gzip, gunzip, tar, zip and unzip.

UNIT II: UNIX KERNEL AND SYSTEM CALLS (09 Periods)

Introduction to system concepts, Kernel Data Structures, System Administration

System calls for the File System: Open, Read, Write, File and record locking, Adjusting the position of file I/O, Close, File

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creation, Creation of special files, Change directory and change root, Change owner and change mode, Stat and fstat , Pipes, Dup, Mounting and unmounting file systems, Link, Unlink, File system abstractions, File system maintenance

UNIT III: PROCESS DESCRIPTION (09 Periods)

Process states and transitions, Layout of system memory, The context of a process, Saving the context of process, Manipulation of the process address, Sleep

UNIT IV: PROCESS CONTROL (08 Periods)

Process creation, Signals, Process termination, Awaiting process termination, Invoking other programs, The user id of a process, Changing the size of a process, The shell, System boot and init process.

UNIT V: ADVANCED SYSTEM MANAGEMENT

(10 Periods)

Networking Tools: TCP/IP Basics, Resolving IP Addresses, The Applications, Ping: Checking the Network, telnet:Remote Login, ftp:File Transfer Protocol, SSH: The Secure Shell, The SSH Tools, The Domain Name System(DNS).

Maintaining Security, Partitions and File Systems, The Standard File Systems and Their Types, fdisk: Creating Partitions, mkfs: Creating a File System, Mounting and Unmounting File Systems, fsck: File System Checking.

Total Periods: 45

TEXT BOOKS:

1. Sumitabha Das, *Unix Concepts and Applications*, TMH, 4th Edition, 2006.
2. Maurice J. Bach, *The Design Of The Unix Operating System*, PHI, 2008.

REFERENCE BOOKS:

1. Graham Glass, King Ables, *Unix for programmers and users*, Pearson, 3rd Edition, 2009.
2. N.B Venkateswarlu, *Advanced Unix programming*, BS Publications, 2nd Edition, 2010.
3. Yashwanth Kanitkar, *Unix Shell programming,* BPB Publications, 2010.

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II B. Tech. – I Semester

(19BT31531) DATA STRUCTURES AND ALGORITHMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: A course on "Data Structures and Algorithms"

COURSE DESCRIPTION:

Sorting and Searching; Linked Lists; Stacks and Queues; Binary Search Trees; AVL trees; Graph Traversing Techniques; Collision Resolution Techniques

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

CO1: Implement sorting and searching algorithms using suitable data structure.

CO2: Develop algorithms to solve real time problems using Linked lists

CO3: Solve computational problems using stacks and queues

CO4: Develop algorithms to perform operations on trees and graphs

CO5: Build solution for collisions in hash tables using suitable data structure

CO6: Work independently and in team to solve problems with effective communication

List of Exercises/List of Experiments:

1. Implement following sorting algorithms
   - **a)** Bubble Sort
   - **b)** Insertion sort
   - **c)** Selection sort
2. Store roll numbers of students who attended placement training program in random order in an array.
   - **a)** Write a program to search whether a particular student attended training or not using linear search
   - **b)** Write a program to search whether a particular student attended training or not using binary search
3. **a)** Department of CSSE has readers club named 'Prerana'. Students of all years can be granted membership on request and they can get books. Similarly one may cancel the membership of club. First node is reserved for head of readers club and last node is reserved for in-charge of readers club. The student's information in each node consisting of name of the student and roll no of the student. Develop a program to perform following operations on readers club member's information using singly linked list.
   - i) Add and delete the members as well as head or even in-charge.
   - ii) Compute total number of members in readers club
   - iii) Display members in readers club
   - iv) Display list in reverse order using recursion
   - v) Sort the list using name and display it.

   b) A Company has N employees and it maintains each employee data with the following attributes like: emp_id, emp-dept,emp_sal, emp_mobileno. Use a menu driven Program to perform following operations on employee's data using DoublyLinked List (DLL).
   - i) Create a DLL of N Employees Data by using end insertion.
   - ii) Display the status of DLL and count the number of nodes in it

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iii) Perform Insertion and Deletion at End of DLL
iv) Perform Insertion and Deletion at Front of DLL
v) Perform Insertion and Deletion at any user specified position of DLL
vi) Exit

4. **a)** Implement a menu driven Program for the following operations on stack using arrays.
   i) Push an Element on to Stack
   ii) Pop an Element from Stack
   iii) Demonstrate how Stack can be used to check Palindrome
   iv) Display the elements of a Stack
   v) Exit
   b) Develop a menu driven program to implement queue operations using arrays
5. **a)** Write a program to implement stack using linked list
   b) Write a program to implement queue using linked list
6. **a)** Develop a program to convert an infix expression to postfix expression using stack
   b) Write a program to evaluate given postfix expression using stack
7. Develop a menu driven program to perform the following operations on a binary search tree
   a) Create a binary search tree
   b) Insert an element into a binary search tree
   c) Delete an element from binary search tree
   d) Traverse the binary search tree in Inorder, Preorder and post order
8. Write a program to perform the following operations on AVL tree
   a) Insert an element into AVL tree
   b) Delete an element from AVL tree
   c) Display the elements of AVL tree in ascending order
9. **a)** Develop a program to implement Breadth first search traversal.
   b) Develop a program to implement Depth first search traversal.
10. Write a program to implement hashing with
    a) Separate Chaining Method
    b) Open Addressing Method

REFERENCE BOOKS/LABORATORY MANUALS:

1. Debasis Samanta, Classic Data Structures,PHI Learning private limited, Second Edition, 2017
2. Robert Lafore, Data Structures & Algorithms in Java, Second Edition, Pearson Education (2008)

ADDITIONAL LEARNING RESOURCES:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/lecture-videos
2. http://nptel.ac.in/courses/106106127/
3. http://www.nptel.ac.in/courses/106102064

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II B. Tech. – I Semester

(16BT30531) DATA STRUCTURES LAB

(Common to CSE, IT and CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: A course on Data Structures

COURSE DESCRIPTION:

Hands on practice on Linked Lists; Type of lists; Stacks and Queues; Trees and Search trees; Graphs; Searching and Hashing.

COURSE OUTCOMES:

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

CO1. Demonstrate practical knowledge on Stacks, Queues, Linked lists, Trees Sorting and Hashing Techniques.
CO2. Analyze suitable data structure to solve real world computing problems.
CO3. Design solutions for complex computational problems using linear and non-linear data structures.
CO4. Solve for Complex computational problems by conducting explorative analysis.
CO5. Use C language for implementing linear and non-linear data structures.
CO6. Apply contextual knowledge of data structures to design applications for societal requirements.
CO7. Communicate effectively using data structures with engineering community, being able to comprehend and write effective programs and Prepare Reports.
CO8. Engage in learning advances in Data structures.

LIST OF EXERCISES:

1. Write program to implement the following data structures:
   (a) Single Linked List
   (b) Double Linked List
   (c) Circular Linked List
2. Write a program to implement Stack and Queue using Linked List.
3. Write a program to evaluate a given postfix expression using Stack.
4. Write a program to convert a given infix expression to postfix form using Stack.

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5. Write a program to implement
    (a) Stack using two Queues
    (b) Queue using two Stacks
6. Write a program to implement In-order, pre-order, post-order tree traversal of Binary Trees.
7. Write a program to perform operations on a Binary Search Tree (BST).
8. Write programs for implementation of graph traversals by applying:
    (a) Breadth First Search
    (b) Depth First Search
9. Implement the following sorting algorithms:
    (a) Merge Sort
    (b) Heap Sort
    (c) Quick Sort
10. Write a program to implement hashing with
    (a) Separate Chaining Method
    (b) Open Addressing Method

REFERENCE BOOKS:

1. Richard Gileberg and Behrouz A. Forouzan, *Data Structures: A Pseudocode Approach with C,* Cengage Learning, 2nd Edition, 2007.
2. G.A.V. Pai, *Data Structures and Algorithms,* Tata McGraw Hill, 2nd Edition, 2009.

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II B. Tech. – I Semester

(19BT31532) OPERATING SYSTEMS LAB

(Common to CSE, CSSE, CSE (AI) and CSE (DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: A course on "Operating Systems."

COURSE DESCRIPTION: Hands-on practice in simulating algorithms for CPU Scheduling, Memory Management, I/O Management, Deadlock Handling mechanisms; Implementing Synchronization problems;

COURSE OUTCOMES: *On successful completion of this course, the students will be able to:*

CO1: Analyze process scheduling problems by applying contextual knowledge on CPU scheduling algorithms.

CO2: Apply memory management and disk scheduling algorithms to attain optimal solutions.

CO3: Devise solution for deadlock avoidance using banker's algorithm.

CO4: Design solutions for process synchronization problems using semaphores and monitors.

CO5: Apply file allocation strategies to achieve optimal disk utilization.

CO6: Work independently and in team to solve problems with effective communication

LIST OF EXPERIMENTS:

1 Simulate the following

   a) Process System Calls.

   b) I/O System Calls.

2 Simulate multi-level queue scheduling algorithm by considering the following scenario. All the processes in the system are divided into two categories – system processes and user processes. System processes are to be given higher priority than user processes. The priority of each process ranges from 1 to 3. Use fixed priority scheduling for all the processes.

3 Demonstrate File Permissions.

4 Simulate the following CPU Scheduling Algorithms:

   a) FCFS b) SJF (Preemptive) c) Priority d) Round Robin

5 Design solutions for the following synchronization problems:

   a) Producer Consumer Problem b) Dining Philosophers Problem.

6 Design Banker's Algorithm for Deadlock Avoidance. Find the safe sequence. If Maximum request of any one process is changed, detect whether a deadlock has occurred or not. Consider the number of resources are three and Jobs are five.

7 Simulate the following Algorithms:

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a) First Fit b) Best Fit c) Worst Fit

8 Simulate the following Page Replacement Algorithms

a) FIFO b) LFU c) LRU d) Optimal

9 Simulate the following Disk Scheduling Algorithms

a) FCFS b)SSTF c) SCAN d) CSCAN

10 Simulate the following file allocation strategies:

a) Contiguous Allocation b) Linked Allocation

REFERENCE BOOKS:

1. Herbert Schildt, *Java the Complete Reference*, Ninth Edition, Oracle Press, 2014.
2. Sachin Malhotra and Saurab Choudhary, *Programming in Java*, Second Edition, Oxford University press, 2014.

SOFTWARES/TOOLS USED:

- Software:J2SDK1.7

  -Eclipse or NetBeans IDE
- Java compatible web browser

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II B. Tech. - I Semester

(16BT31531) OPERATING SYSTEMS LAB

(Common to CSE, IT and CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	*50*	*100*	-	-	*3*	*2*

PRE-REQUISITE: A course on Operating Systems.

COURSE DESCRIPTION: Hands on practice in simulating algorithms for CPU Scheduling, Memory Management, I/O Management, Deadlock Handling mechanisms; Implementing Synchronization problems; practice on UNIX commands.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge of the following algorithms to solve problems:
   i. CPU Scheduling
   ii. Memory Management
   iii. I/O Management

CO2. Formulate and analyze solutions to problems pertaining to Memory and I/O.

CO3. Designing models for deadlock handling mechanisms.

CO4. Develop skills in basic UNIX commands.

CO5. Use appropriate APIs' available in modern operating systems (such as threads, system calls, semaphores, etc...) for software development.

CO6. Communicate effectively on complex operating system problems with implication to User-friendliness.

CO7. Develop and demonstrate user defined libraries to communicate with the kernel or effective implementation of projects across multidisciplinary environments

LIST OF EXPERIMENTS:

1. Write a program to implement the following system calls:
   a) fork b) exec c) getpid d) wait
2. a. Write a program to demonstrate File Permissions.
   b. Write a program to implement named and unnamed pipes.
3. Implement the following CPU Scheduling Algorithms:
   a) FCFS b) SJF (Preemptive) c) Round Robin d) Priority. Use the following set of processes, compare the performance of above scheduling policies

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Process Name	Arrival Time	Processing Time	Priorities
A	0	3	2
B	1	5	4
C	3	2	1
D	9	5	5
E	12	5	3

4. Implement the following synchronization problems:
   a) Producer Consumer Problem
   b) Dining Philosopher's Problem.

Implement Banker's Algorithm for Deadlock Avoidance and Detection. Find the safe sequence. If Max. request of any one process is changed, detect whether deadlock is occurred or not. Consider number of resources are three and Jobs are five as shown in the figure:

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3			
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2	3	3	2
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

6. Implement the following Algorithms:
   a) First Fit b) Best Fit c) Worst Fit

7. Implement multiprogramming with fixed number of tasks and variable number of tasks. The size of the memory is 1000K. Operating system size is 200K. Number of processes are P1, P2, P3 with sizes 150K, 100K and 70K.

8. Implement the following Page Replacement Algorithms:
   a) FIFO b) LFU c) LRU d) Optimal
   Consider number of frames are three and Reference string is
   2 3 2 1 5 2 4 5 3 2 4 2 4 5

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II B. Tech. – I Semester

(19BT31533) **WORKSHOP IN COMPUTER SCIENCE AND SYSTEMS ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: A course on "Programming for Problem Solving"

COURSE DESCRIPTION:

Hands-on practice PC Hardware; Installation of Operating System; Software and Hardware Troubleshooting; Microsoft Office- Word and Excel; C Language- Operators, Expressions, Decision Making Statements, Looping Statements, Arrays and Functions.

COURSE OUTCOMES:

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

CO1: Devise solutions to the basic problems using C Language constructs.

CO2: Solve problems by applying functions, structures, dynamic memory allocation and pointers.

CO3: Develop, maintain and modify Web pages effectively using markdown.

CO4: Design personal portfolioin customized style by using git and Jekyll themes.

CO5: Build simple mobile applications using MIT App inventor.

CO6: Work independently and communicate effectively in oral and written forms.

LIST OF EXPERIMENTS:

I: C Programming:

1 A Write a program to evaluate the following algebraic expressions after reading necessary values from keyword.

i) $(ax+b)/(ax-b)$ ii) $2.5\log x+\cos 32^{o}+|x^{2}+y^{2}|+2xy$
iii) $x^{5}+10x^{4}+8x^{3}+4x+2$ iv) ae^{kt}

B Write a program to calculate commission for the input value of sales amount. Commission is calculated as per the following rules:

i) Commission is **NIL** for sales amount Rs. 5000.

ii) Commission is 2% for sales when sales amount is >Rs. 5000 and <= Rs. 10000.

iii) Commission is 5% for sales amount >Rs. 10000.

2 A Write a program to find the grace marks for a studentusing switch. The user should enter the class obtained bythe student and the number of subjects he has failed in.

Use the following rules:

i. If the student gets first class and the number of subjectsfailed is >3, then no grace marks are awarded. If thenumber of subjects failed is less than or equal to '3' thenthe grace is 5 marks per subject.

ii. If the student gets second class and the number of subjectsfailed in is >2, then no grace marks are awarded. If thenumber of subjects failed in less

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		than or equal to '3' thenthe grace is 4 marks per subject. iii. If the student gets third class and the number of subjectsfailed in is >1, then no grace marks are awarded. If thenumber of subjects failed in is equal to '1' then the graceis 5 marks per subject
	B	Write a program to find the sum of individual digits of a positive integer using for loop
3	A	Write a program to generate all the prime numbers between 1 and N using while loop
	B	Write a program to generate Fibonacci sequence for N numbers using do-while loop.
4	A	Write a program to perform the following: i) Addition of two matrices. ii) Multiplication of two matrices.
	B	Write a program to implement (i) Call by value (ii) Call by reference.
5	A	Write a program to find factorial of a given number using recursion.
	B	Write a program that uses functions to perform the followingoperations: Write a program to determine whether the given string ispalindrome or not.
6		Define a structure to store employee's data with the following specifications: Employee-Number, Employee-Name, Basic pay, Date of Joining i. Write a function to store 10 employee details. ii. Write a function to implement the following rules while revising the basic pay. If Basic pay<=Rs.5000 then increase it by 15%. If Basic pay> Rs.5000 and <=Rs.25000 then it increase by 10%. If Basic pay>Rs.25000 then there is no change in basic pay. Write a function to print the details of employees who have completed 20 years of service from the date of joining.
7	A	Write a Program to calculate the sum of n numbers entered by the user using dynamic memory allocation functions.
	B	Write a Pointer Program to swap two numbers without using the 3rd variable.
II: Source Code Management Using Git and GitHub:		
8		Installing Git, Configuring Git, Creating a Git repository, Creating and editing files, Adding files to Git repository, Making changes and tracking them, Synchronizing local Git repository with GitHub, Deleting and renaming files.
9		Markdown Syntax: Adding text of various styles and formats, Adding images along with text, Creating Ordered/Unordered list, Adding videos/ pdfs to the markdown file, adding links in the markdown file.
10		GitHub Pages: Creation of personal portfolio site- Creating a GitHub Page using Markdown and Jekyll themes forrepositories.
III: Build Apps with MIT App Inventor:		
11		Building the App "HelloCodi": Select components to design app, Programming with the Blocks Editor, Playing the Sound, Packaging app.
12		Building the simple Game APP "BallBounce".
13		Building the Drawing App "DigitalDoodle".

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REFERENCE BOOKS:

MIT App Inventor:

1. http://appinventor.mit.edu/

GIT Hub:

1. Scott chacon, Ben Straub, "**Pro Git**", Second Edition, APress open, 2014.

C LANGUAGE:

1. Behrouz A. Forouzan and Richard F. Gilberg, "**A Structured Programming Approach using C**," Third Edition, Cengage Learning, New Delhi, 2007.
2. PradipDey and ManasGhosh, "**Programming in C**," Second Edition, Oxford University Press, New Delhi, 2007.

SOFTWARES/Tools used:

System Software: C Compiler/Code Blocks, MIT App Inventor, Git hub.

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II B.Tech. I Semester

(19BT315AC) DESIGN THINKING

(Audit Course)

(Common to CE, ME, CSE, CSSE, IT, CSE (AI), CSE (DS) and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PRE-REQUISITES: -

COURSE DESCRIPTION: Design thinking process, Design thinking phases, empathy tools; Idea generation, visualizing and empathizing; Fidelity for prototypes, prototyping; prototyping for physical products.

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

CO1: Analyze design thinking concepts and principles to perform human centered design process for creative problem solving.

CO2: Create empathy maps to visualize user attitudes and behavior for gaining insights of customers.

CO3: Develop innovative products or services for a customer base using ideation techniques.

CO4: Build prototypes for complex problems using gathered user requirements.

CO5: Apply design thinking tools techniques to produce good design and relevant products or services for a specific target market.

CO6: Improve prototype by testing it with a specific set of users for making it sustainable by following ethics.

DETAILED SYLLABUS:

UNITI: INTRODUCTION TO DESIGN THINKING **(6 Periods)**

Design Thinking Process: Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, Understanding design thinking and its process model, Design thinking tools.

UNIT II: EMPATHIZE **(6 Periods)**

Design thinking phases, How to empathize, Role of empathy in design thinking, purpose of empathy maps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools : Customer Journey Map, Personas.

UNIT III: IDEATION **(6 Periods)**

Challenges in idea generation, need for systematic method to connect to user, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method, Ideation Tools: How Might We? (HMW), Story board, Brainstorming.

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UNITI V: PROTOTYPING **(6 Periods)**

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype

UNIT V: TESTING PROTOTYPES **(6 Periods)**

Prototyping for digital products: What's unique for digital, Preparation; Prototyping for physical products: What's unique for physical products, Preparation; Testing prototypes with users.

Total Periods: 30

Topics for self-study are provided in the lesson plan

TEXTBOOKS:

1. S.Salivahanan, S.Suresh Kumar, D.Praveen Sam, "Introduction to Design Thinking",Tata Mc Graw Hill, First Edition,2019.
2. Kathryn McElroy, "Prototyping for Designers: Developing the best Digital and Physical Products", O'Reilly,2017.

REFERENCE BOOKS:

1. Michael G. Luchs, Scott Swan , Abbie Griffin,"Design Thinking – New Product Essentials from PDMA", Wiley, 2015.
2. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", 2012.

ADDITIONAL LEARNING RESOURCES:

1. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
2. https://www.ibm.com/design/thinking/page/toolkit
3. https://www.interaction-design.org/literature/article/define-and-frame-your-design-challenge-by-creating-your-point-of-view-and-ask-how-might-we
4. https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking
5. https://nptel.ac.in/courses/109/104/109104109/
6. https://nptel.ac.in/courses/110106124/

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II B. TECH. – II Semester

(19BT41531) DESIGN AND ANALYSIS OF ALGORITHMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: A course on "Design and Analysis of Algorithms"

COURSE DESCRIPTION: Divide and conquer; Quick Sort; Merge Sort; Kruskal's Algorithm; Prim's Algorithm; Dijkstra's Algorithm; Dynamic Programming; Greedy method; Back tracking method; Floyd's Algorithm

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

CO1: Analyze the performance of Merge sort and quick sort algorithms using divide and conquer technique

CO2: Develop algorithms to solve knapsack problem using greedy and dynamic programming methods

CO3: Devise solutions for finding minimum cost spanning tree by using kruskal's and prim's algorithms

CO4: Solve different shortest path problems by applying Floyd's and Dijkstra's algorithms

CO5: Implement algorithms to solve real world problems using Dynamic Programming and backtracking methods

CO6: Work independently and communicate effectively in oral and written forms.

List of Exercises/List of Experiments:

1. Sort a given set of n integer elements using Quick Sort and merge sort methods and compute its time complexities. Run the programs for varied values of n >1000 and record the time taken to sort. Plot a graph of the time taken versus n for both algorithms. The elements can be read from a file or can be generated using the random number generator. Demonstrate how the divide and conquer method works along with its time complexity analysis: worst case, average case and best case.
2. Write a program to implement knapsack problem using greedy method.
3. a) Write a program to find minimum cost spanning tree using Kruskal's Algorithm

   b) Write a program to find minimum cost spanning tree using Prim's Algorithm
4. Write a program to find shortest paths to other vertices using Dijkstra's algorithm from a given vertex in a weighted connected graph.
5. Write a program to implement 0/1 Knapsack problem using Dynamic Programming method.
6. Write a program to implement All-Pairs Shortest Paths problem using Floyd's algorithm.
7. Write a program to implement Travelling Sales Person problem using Dynamic programming method.
8. Write a program to implement backtracking algorithm for the N-queens problem.
9. Write a program to find a subset of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5,

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6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.

10. Write a program to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

REFERENCE BOOKS/LABORATORY MANUALS:

1. Ellis Horowitz, Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia Publications Pvt. Ltd, New Delhi, 2nd Edition, 2007.

SOFTWARE/Tools used:

Software: JDK 1.8

Operating System: Windows/ Linux

ADDITIONAL LEARNING RESOURCES:

- NPTEL course on Design and Analysis of Algorithms

  URL: https://nptel.ac.in/courses/106/101/106101060/

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I B. Tech. - I Semester (ECE, EEE & EIE) /
I B. Tech. - II Semester (CSE,CSSE,IT,CE & ME)

(19BT1AC01) SPOKEN ENGLISH

(Audit Course)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PRE-REQUISITES: -

COURSE OBJECTIVES:

- To impart the knowledge of day to day conversational expressions.
- To enhance contextual vocabulary and technical jargon for effective usage of language.
- To improve functional grammar for speaking and writing without errors.
- To acquaint with appropriate conversational and narrating techniques for effective communication.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze the techniques of listening, speaking, reading, writing and apply through functional English to communicate effectively with the engineering community and society.

DETAILED SYLLABUS:

UNIT I - FUNCTIONAL ENGLISH: (6 periods)

Introduction - Functional Spoken English; Just a Minute; **Listening – Speaking:** Do's and Don'ts; **Expressing:** Ability/ Admiration/ Agreement/ Anger/ Annoyance/ Appreciation/ Pleasure/ Sarcasm/ Satisfaction/ Surprise/ Approval/ Capability/ Certainty/ Condolences/ Doubt/ Fear/ Gratitude/ Possibility/ Worry; **Asking for:** Advice/ Clarification/ Direction/ Information/ Permission/ Predictions/ a recommendation

UNIT II - VOCABULARY BUILDING: (6 periods)

Vocabulary for day-to-day conversations; Introduction: Vegetables/ Groceries/ Fruits/ Weather; Parts of a Human body/ Dresses/ Furniture/ Relations; Birds/ Cries of Animals; Food/ Hospitality/ Houses/ Rooms/ Tools; Airport/ News Paper/ Books/ Gems; Corporate Vocabulary/ Jobs/ Occupations/ Diseases; British/ American spelling; Slang Words and Technical Jargon

UNIT III - FUNCTIONAL GRAMMAR - I: (6 periods)

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English Grammar and the Indian Student; Introduction: Parts of Speech, Verb forms; Tenses; Voice; Speech

UNIT IV - FUNCTIONAL GRAMMAR - II: (6 periods)

Universal Auxiliaries; Sentence making for an effective communication; Sentence Structure -WH- Questions - How to frame Questions and give answers; Question Tags; Subject and verb agreement; Spotting Errors

UNIT V – COMMUNICATION SKILLS: (6 periods)

Polite, Courteous and diplomatic terms; Useful daily expressions; Courtesy, Good manners and Etiquette; Conversation Techniques; Narrating/ Reading/ Listening to stories; Telling Stories

Total Periods: 30

TEXT BOOKS:

1. L. Adinarayana and V. Prakasam, *Spoken English*, Neelkamal Publications Pvt. Ltd., New Delhi, 2008
2. Ram Bhasker Raju, *The Complete Book on Spoken English*, Goutham Buddha Publications, Hyderabad, 2002.

REFERENCE BOOKS :

1. Sabina Pillai, *Spoken English for my World,* Oxford University Press, New Delhi, 2016.

2. K. R. Lakshminarayanan, *Speak in English,* Scitech Publications, Chennai, 2009.

ADDITIONAL LEARNING RESOURCES

- https://www.britishcouncil.in/programmes/english-partnerships/state/skills-projects/AP-English-Skills.
- https://www.fluentu.com/blog/english/websites-to-learn-english/

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I- B. Tech - I/II Semester

(19BT1BS02) BIOLOGY FOR ENGINEERS

(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	2	-	-	2

PRE REQUISITE: --

COURSE OBJECTIVES:

- To introduce the molecular basis of life and provide the basis for classification of living organisms
- To describe about biomolecules, enzymes, genes and the transfer of genetic information**.**
- To introduce the techniques used for modification of living organisms and applications of biology**.**

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply the basic knowledge of biology to understand the significance of various biological techniques.

CO2. Identify the role of DNA in the molecular basis of information transfer and understand single gene disorders related to the health perspective.

CO3. Apply the basic knowledge of bio-analytical devices and methods to address societal, health and legal issues.

DETAILED SYLLABUS:

UNIT I – LIVING ORGANISMS (6 Periods)

Comparison of biological organisms with manmade systems, Classification of living organisms, Cellular basis of life, differences between prokaryotes and eukaryotes, classification on the basis of carbon and energy sources, molecular taxonomy

UNIT II – PROTEINS, NUCLEIC ACIDS AND ENZYMES (6 Periods)

Biomolecules, structure and functions of proteins and nucleic acids, Industrial applications of enzymes, Fermentation and its industrial applications

UNIT III – GENETICS AND MOLECULAR BIOLOGY (6 Periods)

Mendel's laws, single gene disorders in humans, Genetic code, DNA replication, Transcription, Translation.

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UNIT IV – RECOMBINANT DNA TECHNOLOGY (6 Periods)

Recombinant DNA Technology: recombinant vaccines, transgenic microbes, plants and animals, animal cloning, biosensors, biochips

UNIT V –HUMAN PHYSIOLOGY AND APPLIED BIOLOGY (6 Periods)

Fundamentals of Human physiology, neurons, synaptic and neuromuscular junctions, Introduction to EEG, DNA fingerprinting, DNA Micro array and Genomics.

Total Periods: 30

TEXT BOOKS:

1. N. A. Campbell, J. B. Reece, et al., *Biology: A global approach*, Pearson Education Ltd, 2018.
2. S. Sing and T. Allen, *Biology for Engineers*, Vayu Education of India, 2014.

REFERENCE BOOKS:

1. B. Alberts, A. Johnson et al., *The molecular biology of the cell*, Garland Science, 6th edition, 2014.

2. A. T. Johnson, *Biology for Engineers*, CRC press, 2011.

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I B. Tech – I Semester (CSE, CSSE, IT, CE & ME)
I B. Tech – II Semester (ECE, EEE & EIE)
(19BT1HS01) COMMUNICATIVE ENGLISH

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	0	--	3

PRE-REQUISITES: -

COURSE OBJECTIVES:

1. To acquaint with the nuances of effective communication correlating with academic content.
2. To understand and interpret the importance of listening techniques for effective communication.
3. To develop reading and writing techniques for effective technical communication.
4. To make use of speaking techniques to communicate effectively in formal and informal situations.

COURSE OUTCOMES: After successful completion of this course, students will be able to:

CO1. Analyze the modes and techniques of listening, speaking, reading, writing and apply appropriately to communicate effectively with the engineering community and society.

DETAILED SYLLABUS:

UNIT I - **INTRODUCTION TO COMMUNICATION** **(9 periods)**

Introduction – Language as a Tool of Communication – Communicative Skills (Listening, Speaking, Reading and Writing) – Effective Communication – Modes of Communication – Barriers to Communication (classification) - Case study

UNIT II - **ACTIVE LISTENING** **(9 periods)**

Introduction –Traits of a Good Listener – Listening Modes – Types of Listening – Barriers to Effective Listening – Listening for General Content and Specific Information - Case study

UNIT III - **EFFECTIVE SPEAKING** **(9 periods)**

Introduction – Achieving Confidence, Clarity and Fluency – Paralinguistic Features – Barriers to Speaking – Types of Speaking – Conferences; significance, planning and preparation and procedure – Symposia and Seminars - Persuasive Speaking - Case study

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UNIT IV - **READING** **(9 periods)**

Introduction – Reading and Interpretation – Intensive and Extensive Reading – Critical Reading ––Techniques for Good Comprehension- SQ3R Reading Technique –Study Skills - Case study

UNIT V – **TECHNICAL WRITING** **(9 periods)**

Introduction – Language – Elements of Style – Techniques for Good Technical Writing – Paragraphs Construction – Essays: types, Steps to Essay Writing and Checklist – Précis Writing - Case study

Total Periods: 45

TEXT BOOKS:

1. Meenakshi Raman & Sangeetha Sharma, *Technical Communication*, Oxford University Press, New Delhi, 2012.

2. Ashraf Rizvi*, Effective Technical Communication*, McGraw-Hill Education (India) Pvt. Ltd., New Delhi, 2018.

REFERENCE BOOKS:

1. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, New Delhi, 2013.

2. Rajendra Pal and J. S. Korlahalli, *Essentials of Business Communication*, Sultan Chand and Son, New Delhi, 2010.

ADDITIONAL LEARNING RESOURCES

1. https://www.skillsyouneed.com/ips/active-listening.html: A useful summary of what active listening skills are.
2. https://en.wikipedia.org/wiki/Active_listening: Wikipedia entry about active listening.
3. https://www.forbes.com/sites/womensmedia/2012/11/09/10-steps-to-effective-listening/#4b27a2503891: Ten steps to Active Listening (by Forbes magazine).
4. https://goo.gl/t1Uqrt: 20 tips for organizing a conference.
5. https://goo.gl/kPMr9u: 10 important issues for speakers at a conference.
6. https://goo/gl/C5bDvv: Wikihow guide to organizing a conference.

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I B. Tech. – I Semester (CSE, CSSE, IT, CE & ME)

I B. Tech. – II Semester (ECE, EEE & EIE)

(16BT1HS01) TECHNICAL ENGLISH

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES: English at Intermediate level

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OBJECTIVES:

CEO1. To impart knowledge of the nuances of communication.
CEO2. To develop Listening, Speaking, Reading and Writing skills in order to use language effectively in distinct situations.
CEO3. To imbibe an attitude of assimilating language skills in the sequence of locating, retrieving, reporting, evaluating, integrating, and accurately citing in the required context.

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

CO1: Demonstrate knowledge in

- Process of communication
- Modes of listening
- Paralinguistic features
- Skimming and Scanning
- Elements of style in writing

CO2: Analyze the possibilities and limitations of language, understanding

- Barriers to Communication
- Barriers to Effective Listening
- Barriers to Speaking
- Formal and metaphorical language

CO3: Design and develop functional skills for professional practice**.**

CO4: Apply writing skills in preparing and presenting documents

CO5: Function effectively as an individual and as a member in diverse teams.

CO6*:* Communicate effectively with the engineering community and society in formal and informal situations**.**

DETAILED SYLLABUS:

UNIT I - **INTRODUCTION TO COMMUNICATION: (9 periods)**

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Introduction –Language as a Tool of Communication – Communicative Skills (Listening, Speaking, Reading and Writing) – Effective Communication – Modes of Communication – Barriers to Communication (classification)

UNIT II - **ACTIVE LISTENING:** **(9 periods)**

Introduction – Reasons for poor Listening – Traits of a Good Listener – Listening Modes – Types of Listening – Barriers to Effective Listening – Listening for General Content and Specific Information

UNIT III - **EFFECTIVE SPEAKING:** **(9 periods)**

Introduction – Achieving Confidence, Clarity and Fluency – Paralinguistic Features – Barriers to Speaking – Types of Speaking – Persuasive Speaking

UNIT IV - **READING**: **(9 periods)**

Introduction and Reading Rates – Reading and Interpretation – Intensive and Extensive Reading – Critical Reading – Reading for Different Purposes – SQ3R Reading Technique – Study Skills

UNIT V – **WRITING**: **(9 periods)**

Introduction – Language – Elements of Style – Techniques for Good Technical Writing – Referencing and Styling – Right Words and Phrases – Sentences

Total Periods: *45*

TEXT BOOKS:

1. Meenakshi Raman & Sangeetha Sharma, *Technical Communication*, Oxford University Press, New Delhi, 2012.

REFERENCE BOOKS:

1. Ashraf Rizvi*, Effective Technical Communication*, McGraw-Hill Education (India) Pvt.Ltd., New Delhi, 2015.

2. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, New Delhi, 2013.

3. Teri Kwal Gamble and Michael Gamble, *Communication Works*, Tata Mc Graw-Hill, New Delhi, 2010.

4. Rajendra Pal and J.S. Korlahalli, *Essentials of Business Communication*, Sultan Chand and Son, New Delhi, 2010.

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I B. Tech. - I/II Semester
(19BT1BS03**) ENGINEERING PHYSICS**
(Common to CSE, CSSE, ECE, EEE, EIE & IT Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	0	--	3

PRE-REQUISITES: -

COURSE OBJECTIVES:

1 To impart knowledge in basic concepts of wave optics, electromagnetic theory and fiber optics.
2 To identify the importance of semiconductors in the functioning of opto-electronic devices.
3 To familiarize the properties and applications of dielectric, magnetic , superconducting and nanomaterials relevant to engineering branches.

COURSE OUTCOMES: After successful completion of the course, a student will be able to:

CO1. Apply the knowledge of light waves to interpret the concepts of Interference, Diffraction and Polarization.

CO2. Demonstrate the concepts of electromagnetic wave propagation in Optical fibers.

CO3. Apply the basic knowledge of semiconductors to understand the functioning of various optoelectronic devices.

CO4. Demonstrate the basic knowledge of dielectric and magnetic properties to understand the various dielectric polarizations and magnetic materials.

CO5. Understand the concepts of superconductors and nanomaterials to familiarize their applications in relevant fields.

DETAILED SYLLABUS:

UNIT-I: WAVE OPTICS (09 periods)

Interference: Principle of superposition - Interference of light - Theory of interference fringes - Conditions for sustained interference - Interference in thin films (reflected light) - Newton's rings - Determination of wavelength.

Diffraction: Fraunhofer diffraction - Single slit diffraction - Diffraction grating - Grating spectrum - Determination of wavelength.

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Polarization: Polarization by reflection, refraction and double refraction - Nicol's prism - Half wave and Quarter wave plate - Engineering applications of interference, diffraction and polarization.

UNIT-II: ELECTROMAGNETIC WAVES AND FIBER OPTICS (10 periods)

Divergence, Curl of Electric and Magnetic Fields - Maxwell's Equations (qualitative) - Electromagnetic wave propagation (conducting and non conducting media).

Introduction to fiber optics - Total Internal Reflection - Critical angle of propagation - Acceptance angle, Acceptance cone - Numerical Aperture - Classification of fibers based on Refractive index profile, modes - Attenuation losses - Dispersion - Propagation of electromagnetic wave through optical fiber - Block diagram of fiber optic communication - Applications of an optical fiber - Fiber optic Sensors (temperature, displacement).

UNIT-III: SEMICONDUCTORS (10 periods)

Origin of energy bands - Classification of solids based on energy bands - Intrinsic semiconductors - Density of electrons in intrinsic semiconductor - Density of holes in intrinsic semiconductor (qualitative) - Intrinsic carrier concentration - Fermi energy - Electrical conductivity of intrinsic semiconductors - Extrinsic semiconductors - Density of charge carriers in n-type - Density of charge carriers in p-type (qualitative) - Direct and Indirect band gap semiconductors - Hall effect, Hall coefficient - Applications of Hall effect - Drift and Diffusion currents - pn junction - Semiconducting materials for optoelectronic devices : Photodiode and Semiconductor diode laser.

UNIT-IV: DIELECTRICS AND MAGNETISM (09 periods)

Introduction to dielectrics - Electric polarization - Dielectric polarizability, susceptibility and dielectric constant - Types of polarizations (qualitative) - Frequency dependence of polarization - Lorentz (internal) field - Dielectric break down - Piezoelectricity - Applications of dielectrics.

Introduction to magnetics - Magnetic dipole moment, magnetization, magnetic susceptibility and permeability - Origin of magnetic moment - Classification of magnetic materials - Hysteresis loop - Soft and hard magnetic materials.

UNIT-V: SUPERCONDUCTORS AND NANOMATERIALS (7 periods)

Introduction to Superconductors, Properties - Critical parameters of Superconductors - Meissner effect - Penetration depth - Types of Superconductors - BCS Theory - Josephson effect (AC & DC) - High T_C Superconductors - Applications.

Basic principles of nanomaterials - Synthesis of nanomaterials by PLD method - Properties of nanomaterials - Applications of nanomaterials.

Total Periods: 45

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TEXT BOOKS:

1. M.N. Avadhanulu, P.G.Kshirsagar & T.V.S Arun Murthy, *A Text book of Engineering Physics*, S. Chand Publications, 11th edition, 2019.
2. P. K. Palaniswamy, *Engineering Physics*, Scitech Publications India Private Limited, 2nd edition, 2009.

REFERENCE BOOKS:

1. K. Thyagarajan, *Engineering Physics*, McGraw-Hill Education (India) Pvt. Ltd, 2016.
2. R.K. Gaur and S.L. Gupta, *Engineering Physics*, Dhanpat Rai Publications (P) Ltd, 2015.

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I B. Tech. – I/II Semester

(16BT1BS02) ENGINEERING PHYSICS

(Common to all branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES: Intermediate / senior secondary Physics

COURSE DESCRIPTION:

Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nanomaterials.

COURSE OBJECTIVES:

CEO1 : To provide the basic knowledge of architectural acoustics, quantum mechanics, lasers, superconductors, optical fibers, semiconductors and nanotechnology.

CEO2 : To develop skills in using semiconductor devices, lasers, and optical fibers.

COURSE OUTCOMES: After completion of the course, a successful student will be able to:

CO1: Acquire basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and nanomaterials.
CO2: Analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.
CO3: Gain skills in designing of lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.
CO4: Develop problem solving skills in engineering context.
CO5: Use relevant techniques for assessing ball milling, pulsed laser deposition, pn-junction, Laser

DETAILED SYLLABUS:
UNIT I – LASERS AND FIBER OPTICS (11periods)

Lasers: Introduction, characteristics of lasers, spontaneous and stimulated emission of radiation, Einstein's coefficients – condition for amplification, population inversion, Nd:YAG laser, Helium-Neon laser, semiconductor laser and applications of lasers.

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Fiber optics: Introduction, principle of optical fiber, acceptance angle, acceptance cone and numerical aperture, classification of optical fibers optical fiber communication system and applications of optical fibers.

UNIT II – PRINCIPLES OF QUANTUM MECHANICS AND BAND THEORY OF SOLIDS (07 periods)

Principles of Quantum Mechanics: Introduction, de-Broglie's hypothesis, Schrödinger's one dimensional wave equation (time independent), significance of wave function, particle in a one dimensional potential box, Fermi-Dirac distribution and effect of temperature (qualitative treatment).

Band Theory of Solids: Electron in a periodic potential, Kronig-Penney model (qualitative treatment), origin of energy bands formation in solids, distinction between conductors, semiconductors and insulators based on band theory.

UNIT III – SEMICONDUCTORS AND DIELECTRIC PROPERTIES OF MATERIALS

(13 periods)

Semiconductors: Introduction, types of semiconductors, intrinsic carrier concentration, electrical conductivity in semiconductors, drift and diffusion currents, Einstein's relation, Hall effect and its applications, direct and indirect band gap semiconductors, p-n junction, energy band diagram of p-n diode, LED, photo diode and Solar cell.

Dielectric Properties of Materials: Introduction, dielectric constant, electronic, ionic and orientation polarizations (qualitative treatment), local field, frequency dependence of polarizability (qualitative treatment), ferroelectricity.

UNIT IV – ACOUSTICS OF BUILDINGS AND SUPERCONDUCTIVITY (07 periods)

Acoustics of Buildings: Introduction, basic requirement of acoustically good hall, reverberation and time of reverberation, Sabine's formula for reverberation time (qualitative treatment), absorption coefficient of sound and its measurement, factors affecting the architectural acoustics and their remedies.

Superconductivity: Introduction, General properties - Meissner effect, penetration depth, Type-I and Type-II superconductors, flux quantization, Josephson effects, BCS theory (qualitative treatment), applications of superconductors.

UNIT V – CRYSTALLOGRAPHY AND NANOMATERIALS (07 periods)

Crystallography: Introduction, crystal planes, crystal directions and Miller indices, separation between successive (hkl) planes, X-ray diffraction by crystal planes, Bragg's law-powder method. **Nanomaterials:** Introduction, principles of nanomaterials, properties of nanomaterials, synthesis of nanomaterials by ball milling and pulsed laser deposition and applications of nanomaterials.

Total Periods: 45

TEXT BOOKS:

1. P. K. Palaniswamy, ***Engineering Physics***, Scitech Publications India Private Limited, 2nd Edition, 2009

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REFERENCE BOOKS:

1. Dr. S. Mani Naidu*,* ***Engineering Physics***, Pearson Education, 1st Edition, 2013.
2. M.N. Avadhanulu,P.G.Kshirsagar, ***A textbook of Engineering Physics***, S.Chand & Company Ltd. Revised edition 2014.
3. K. Thyagarajan***, Engineering Physics-I***, McGraw-Hill Education (India) Pvt.Ltd. 2015

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I B. Tech. - I/II Semester

(19BT1BS31**) ENGINEERING PHYSICS LAB**
(Common to CSE, CSSE, ECE, EEE, EIE & IT Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE REQUISITE: --
COURSE OBJECTIVES:

1 To impart knowledge in basic principles of optical, electrical and electronic instrumental techniques.
2 Develop skills in the design and functioning of components in the electronic circuits.
3 Develop the practical skills in analyzing optical, electrical and electronic properties of materials using different instruments for engineering applications.
4 Imbibe scientific attitude in applications of various experiments.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply the basic knowledge of light waves and semiconductors to demonstrate the functioning of optoelectronic devices.
CO2. Understand the experimental procedures to calculate the thickness of a thin film, Hall coefficient, Hysteresis losses, and acceptance angle of an optical fiber.
CO3. Determine the experimental values of magnetic field induction, wave length of a light source, energy gap of a semiconductor.
CO4. Apply skills to plot characteristic curves to determine the various parameters of semiconductor diodes.
CO5: Work independently and in teams to solve problems with effective communication.

A minimum of any **Ten** experiments are to be conducted among the following:
LIST OF EXPERIMENTS:

1. Determine the thickness of the wire using wedge shape method.
2. Determination of wavelength of light source by Newton's ring method.
3. Determination of wavelength by plane diffraction grating method.
4. Estimation of magnetic field along the axis of a circular coil carrying current.
5. Study the variation of Magnetic field induction (B) vs Magnetic field strength (H) by magnetizing the magnetic material (B-H Curve).
6. Determination the numerical aperture of a given optical fiber and hence to estimate its acceptance angle.
7. Determination of number of charge carriers and Hall coefficients of a given semiconductor using Hall Effect.
8. Determine the resistivity of semiconductor by Four probe method.
9. Determine the energy gap of a semiconductor.
10. Study the I-V characteristics of pn junction diode.
11. Estimation of threshold voltages of different LED's.
12. Study the characteristics of Photodiode.
13. Determination of wavelength of laser by using diffraction grating.

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REFERENCES:

1. S. Balasubramaniah and M.N. Srinivasan, *A Text book of practical physics*, S Chand Publications, 2017.
2. *http://vlab.amrita.edu/index.php* - Virtual Labs, Amrita University.

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I B. Tech. – Semester

(16BT1BS32) ENGINEERING PHYSICS LABORATORY

(Common to all Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	2

PRE-REQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION:

Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and a.c source using a.c sonometer, magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OBJECTIVES:

CEO 1: Develop skills in the design and functioning of components in the electronic circuits.

CEO 2: Develop the practical skills in analyzing optical, electrical, electronic and mechanical properties of materials using different instruments for engineering applications.

CEO 3: Imbibe scientific atitude in applications of various experiments.

COURSE OUTCOMES: After completion of the course, a successful student will be able to:

CO1: Acquire basic knowledge about semiconductor materials, magnetic materials and lasers.

CO2: Acquire analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.

CO3: Develop skills in designing electronic circuits using semiconductor components.

CO4: Acquire skills to use instrumental techniques in ac sonometer and Melde's experiment.

CO5: Apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

LIST OF EXCERSICES:

Conduct a minimum of any **Ten** of the following experiments.

1. Determination of wavelength of a laser source using Diffraction Grating.
2. Determination of particle size by using a laser source.
3. Determination of Numerical aperture and acceptance angle of an optical fiber.
4. Melde's experiment - transverse & longitudinal modes.
5. Magnetic field along the axis of a current carrying coil- Stewart and Gee's method.

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6. Calculation of ac frequency using sonometer.
7. I-V Characteristics of a p-n Junction diode.
8. Energy gap of a material of a p-n Junction.
9. Characteristics of LED source.
10. Characteristics of Photo diode.
11. Hall Effect.
12. Determination of rigidity modulus of the material of the wire using torsional pendulum.

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I B. Tech. - I/II Semester
(19BT1BS04**) ENGINEERING CHEMISTRY**
(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE REQUISITE: -

COURSE OBJECTIVES:

1 To provide basic knowledge in quantum-mechanical model of atom, bonding theories, water treatment, electrochemistry, corrosion, instrumental methods, fuels and lubricants.

2 To develop skills in identification of molecular shapes, measurement of hardness of water, calculation of cell potential, calorific value of fuels.

3 To impart basic knowledge pertains to various instrumental methods, their applications and characterization of molecular structures using instrumental methods.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply the basic knowledge of quantum mechanical approach to atomic structure and bonding theories to identify shapes of different orbitals and molecules.

CO2. Analyze and solve problems associated with hardness of water, boiler troubles and address the societal, health and safety issues related to quality of water.

CO3. Apply the basic knowledge of corrosion phenomenon to identify solutions for control of corrosion and demonstrate competency in the basic concepts of electrochemical cells.

CO4. Demonstrate the basic knowledge of instrumental methods and their applications in the structural analysis of materials.

CO5. Apply the basic knowledge of fuel chemistry and lubricants to identify the quality of fuels and lubricants.

DETAILED SYLLABUS:

Unit I: Atomic Structure and Bonding Theories (9 periods)

Quantum-mechanical model of atom, Schrodinger wave equation, significance of Ψ and Ψ^2 , applications to particle in a box and hydrogen atom; Molecular orbital theory – bonding in homo and hetero nuclear diatomic molecules – energy level diagrams of N_2, O_2, NO and CO; Π-molecular orbitals of butadiene and benzene; VSEPR theory and molecular shapes.

Unit II: Water Treatment (9 periods)

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Introduction, types of water, Impurities in water and their consequences. Hardness of water, units of hardness, disadvantages of hardness, measurement of hardness by EDTA method, numerical problems on measurement of hardness of water, boiler troubles- priming & foaming, scales & sludge, caustic embrittlement, boiler corrosion, softening of water– Ion exchange process, zeolite process, desalination of brackish water by reverse osmosis, Drinking water treatment- Ozonisation & chlorination, specifications of potable water as per WHO and BIS standards. Fluoride in ground water: Effects on human health, defluoridation method – Nalgonda method; merits and demerits of various defluoridation methods.

Unit III: Electrochemistry and Applications (10 periods)

Electrode potential, Nernst equation, reference electrodes (Calomel electrode and glass electrode), electrochemical cell, cell potential calculations. Primary cells – dry cell, alkali metal sulphide batteries, Secondary cells – lead acid, lithium ion batteries, Fuel cells - Hydrogen-oxygen fuel cell, Methanol-oxygen fuel cell, Solid-oxide fuel cell.

Corrosion: Introduction, Definition, types of corrosion- wet (galvanic corrosion, concentration cell corrosion) and dry corrosion, Factors influencing corrosion, control of corrosion- sacrificial anodic protection, Impressed current cathodic protection, electroplating method (Nickel).

Unit IV: Instrumental Methods and Applications (9 periods)

Introduction to spectroscopy–types of energy present in molecules, types of spectra, UV-Vis spectroscopy – principle, types of electronic transitions, chromophore, auxochrome, Bathochromic shift, Hypsochromic shift, Instrumentation of UV-Vis spectrophotometer, applications; Infrared spectroscopy – principle, types of vibrational modes, group frequencies, Instrumentation of IR spectrophotometer, applications. principle and applications of physicochemical methods (SEM, TEM, X-ray diffraction).

Unit V: Fuel chemistry and Lubricants (8 Periods)

Fuel chemistry: Types of fuels, calorific value, numerical problems based on calorific value; Liquid fuels, cracking of oils (Thermal and Fixed-bed catalytic cracking), knocking and anti-knock agents, Octane and Cetane values, Synthetic petrol: Fischer-Tropsch method and Bergius process.

Lubricants: Definition, functions of lubricants, mechanism of lubrication, classification of lubricants, properties of lubricants – viscosity and viscosity index , flash and fire points, cloud and pour points, Aniline points, neutralization number and mechanical strength.

Total Periods: 45

TEXT BOOKS:

1. P. C. Jain & Monika Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013.
2. K.N. Jayaveera, G.V. Subba Reddy and C. Ramachandriah, *Engineering Chemistry,* Mc.Graw Hill Publishers, New Delhi.

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REFERENCE BOOKS:

1. J. D. Lee, *Concise Inorganic Chemistry*, Oxford University Press, 5th edition 2010.
2. Skoog and West, *Principles of Instrumental Analysis*, Thomson, 6th edition, 2007.
3. Peter Atkins, Julio de Paula and James Keelar, *Atkins' Physical Chemistry*, Oxford University Press, 10th edition, 2010.

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I-B. Tech - I/II Semester
(16BT1BS01): ENGINEERING CHEMISTRY
(Common to All Branches of Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nano Chemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OBJECTIVES:

1. To impart basic and applied knowledge in water technology, Chemistry of Engineering materials, Nano Chemistry, Green Chemistry, bio-diesel, electro chemical cells, sensors, corrosion and lubricants.

2. To develop skills in analysis of materials and design of systems for engineering applications.

3. To imbibe an attitude among students to practice Engineering in compliance with principles of Green Chemistry.

COURSE OUTCOMES: After completion of the course, a successful student is able to:

1. Acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.
2. Develop analytical skills in:
   a. Determination of hardness of water.
   b. Determination of viscosity, flame and fire points, cloud and pour points.
3. Develop designing skills in:
   a. Synthesis of engineering plastics.
   b. Chemical methods for the synthesis of Nano materials.
4. Develop skills for providing solutions through:
   a. Mitigation of hardness of water.
   b. Newer Nanomaterials and engineering plastics for specific applications
5. Acquire awareness to practice engineering in compliance to modern techniques such as:
   a. Nalgonda technique for defluoridation of water
   b. Electroplating technique for control of corrosion.
6. Acquire awareness to societal issues on:
   a. Quality of water.
   b. Bio-diesel
   c. Chemical materials utility and their impact.

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DETAILED SYLLABUS:

UNIT–I: WATER TECHNOLOGY [9 periods]

Introduction, types of water, impurities in water and their consequences, types of hardness of water, units of hardness of water, disadvantages of hardness of water, estimation of hardness of water by EDTA method, Boiler troubles: Scales and Sludges, Caustic embrittlement, Boiler corrosion and Priming and Foaming. Softening of water: Zeolite process and Ion exchange process, advantages and disadvantages. Desalination of brackish water by Reverse Osmosis, Numerical problems on estimation of hardness of water.

Fluorides in water: effects on human health, defluoridation method-Nalgonda method; comparison of merits and demerits of various defluoridation methods (Nalgonda, Bone Charcoal, Activated Alumina, Contact precipitation, Brick, Reverse osmosis).

UNIT – II: CHEMISTRY OF ENGINEERING MATERIALS [9 periods]

Engineering Plastics: Definition, general properties, synthesis, properties and applications of PC, PTFE, and PMMA.

Conducting polymers: Definition, types of conducting polymers: Intrinsic and extrinsic conducting polymers with examples, engineering applications of conducting polymers.

Biodegradable polymers: Definition, properties, classification, mechanism of degradation of biodegradable polymers and their applications.

Composites – Introduction, types of composites: fiber reinforced particulate and layered composites with examples, advantages of composites and applications.

UNIT– III: NANO CHEMISTRY AND GREEN CHEMISTRY [9 periods]

Nano Chemistry: Introduction, classification, properties and applications of Nano materials (nano particles, nano tubes, nano wires, nano composites, dendrimers); synthesis of Nano materials – Sol-gel process.

Green Chemistry: Introduction, principles of green chemistry, Tools of Green Chemistry with Examples, Applications of Green Chemistry in science and technology.

Biodiesel: Introduction, Synthesis (Trans esterification method), advantages, disadvantages and applications.

UNIT–IV: ELECTROCHEMICAL CELLS AND SENSORS [9 periods]

Electrochemical cell: Introduction, EMF of an electrochemical cell.

Batteries: Introduction, types of Batteries: primary and secondary batteries with examples, Ni-Cd batteries, Lithium-ion batteries, Lithium- Polymer batteries, Applications of batteries.

Fuel Cells: Definition, examples: H_2 – O_2 Fuel cell, solid oxide fuel cell, Bio-fuel cell and applications of fuel cells.

Sensors - Introduction, Types of Sensors, electrochemical sensor: construction and working principle of potentiometric sensor, and applications of electrochemical sensors.

UNIT–V: CORROSION AND LUBRICANTS [9 periods]

Corrosion: Introduction, Definition, types of corrosion (dry and wet corrosion), galvanic corrosion, concentration cell corrosion, Factors influencing corrosion, Corrosion control: cathodic protection; sacrificial anodic protection and impressed current cathodic protection; protective coatings: Galvanizing and Electroplating (Nickel).

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Lubricants: Definition, functions of lubricants, mechanism of lubrication, classification of lubricants, properties of lubricants – viscosity, flash and fire points, cloud and pour points, Aniline points, neutralization number and mechanical strength.

Total periods: 45

TEXT BOOKS:

1. P.C.Jain & Monika Jain, **Engineering Chemistry**, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013.
2. K.N. Jayaveera, G.V. Subba Reddy & C. Ramachandraiah **Engineering Chemistry**, Mc. Graw-Hill Higher Education, Hyderabad, 1st edition, 2015.

REFERENCE BOOKS:

1. A.K. Bandyopadhyay, **Nano Materials,** New Age international publishers, 2nd edition, 2014.
2. Paul T. Anastas, John C Warner, **Green Chemistry: Theory and practice,** Oxford University Press, 2000

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I B.Tech. - I/II Semester
(19BT1BS32**) ENGINEERING CHEMISTRY LABORATORY**
(Common to All Branches of Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE REQUISITE: -

COURSE OBJECTIVES:

- To impart knowledge in basic principles of volumetric and instrumental methods of analysis.
- To develop practical skills encompassing quantitative analysis of materials by volumetric methods.
- To develop practical skills to analyze the materials by instrumental methods.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply analytical skills for the quantitative estimation of materials through volumetric methods of analysis and address the societal, health issues related to quality of water.
CO2. Develop analytical skills for the quantitative estimation of materials through instrumental methods of analysis.
CO3. Work independently and in teams to solve problems with effective communication.

A minimum of any **Ten** experiments are to be conducted among the following:

LIST OF EXPERIMENTS :

1. Estimation of Hardness of water by EDTA method
2. Determination of alkalinity of Water sample
3. Estimation of Dissolved Oxygen in water by Winkler's method.
4. Estimation Fe (II) by Dichrometry
5. Conductometric titration of strong acid Vs strong base
6. Estimation of Ferrous ion by Potentiometry
7. Determination of strength of acid by P^H metric method
8. Determination of Strength of an acid in Pb-Acid battery
9. Determination of Viscosity by Ostwald's viscometer
10. Determination of percentage of Iron in Cement sample by colorimetry
11. Estimation of residual chlorine in drinking water.
12. Identification of simple organic compounds by UV-Vis and IR spectroscopy

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TEXT BOOKS:

1. K. Mukkanti, *Practical Engineering Chemistry*, BS Publications, 2013.

2. K.N. Jayaveera, K.B. Chandra Sekhar, *Chemistry laboratory manual*, S.M. Enterprises Limited, 2013.

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I-B. Tech- I/II Semester

(16BT1BS31): ENGINEERING CHEMISTRY LABORATORY

(Common to All Branches of Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	2

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of P^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, P^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OBJECTIVES: This course enables the students to:

1. Develop practical skills encompassing quantitative analysis of materials by volumetric methods, instrumental methods and acquire designing skills for the synthesis of Nano materials and Engineering plastics.

COURSE OUTCOMES: After completion of the course, a successful student is able to:

1. Acquire basic knowledge about the volumetric analysis and synthesis of materials used for engineering applications**.**
2. Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.
3. Develop designing skills for the synthesis of polymers and Nanomaterials.
4. Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, P^H of a solution, determination of viscosity of lubricants and estimation of iron in cement.
5. Provide solutions for environmental issues through determination of quality of water.

A minimum of any **Ten** experiments are to be conducted among the following:

LIST OF EXPERIMENTS:

1. Estimation of Hardness of water by EDTA method.
2. Estimation of alkalinity of Water.
3. Estimation of Dissolved Oxygen in water.

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4. Estimation of Ferrous Iron by Dichrometry.
5. Preparation of Novalac Resin.

6. Synthesis of Nano metal-oxide using sol– gel process.
7. Conductometric titration of strong acid Vs strong base
8. Estimation of Ferrous ion by Potentiometry.
9. Determination of amount of corrosion of metals in different medium
10. Measurement of viscosity of lubricants by Ostwald viscometer.
11. Determination of P^H of a given solution by P^H metry.
12. Estimation of Ferric iron in cement by Colorimetric method.

Duration: 3 Periods for each experiment

Total periods: 36

TEXT BOOKS:

1. K. Mukkanti, *Practical Engineering Chemistry*, BS Publications, 2013.
2. K.N. Jayaveera, K.B. Chandra Sekhar, *Chemistry laboratory manual*, S.M. Enterprises Limited, 2013.

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I B. Tech. - II semester
(19BT2BS01) **TRANSFORMATION TECHNIQUES AND LINEAR ALGEBRA**
(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	--	4

PRE-REQUISITE: -

COURSE OBJECTIVES:

- To familiarize with Fourier series of a periodic function, the Fourier integral of a function and the Fourier transformation.
- To introduce Laplace transform techniques for solving differential equations.
- To acquaint the students with concepts of matrices and linear transformations useful in engineering contexts.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1: Apply the knowledge of Fourier and Laplace transform techniques to solve differential equations.

CO2: Analyze linear transformations and associated matrices to solve engineering problems by applying the knowledge of linear algebra.

DETAILED SYLLABUS:

UNIT- I: Fourier Series and Fourier Transforms (9 Periods)

Fourier series: Determination of Fourier coefficients, Euler's formulae, convergence of Fourier series (Dirichlet's conditions), Fourier series in $(0,2l),(-l,l)$; Fourier series of even and odd functions; Half-range Fourier sine and cosine expansions in $(0,l)$; Fourier integral theorem (statement only), Fourier sine and cosine integrals; Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier transforms.

UNIT-II: Laplace Transforms (9 Periods)

Definition of Laplace transform, existence conditions, Laplace transform of standard functions, Properties of Laplace transforms, Laplace Transforms of derivatives, Laplace Transforms of integrals, multiplication by t^n, division by t, Laplace transform of periodic functions, Laplace transforms of unit step function and unit impulse function.

UNIT- III: Inverse Laplace Transforms (9 Periods)

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Inverse Laplace transform by different methods; Convolution theorem (without proof), inverse Laplace transforms by convolution theorem; Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT- IV: Linear Algebra-I (Matrices) (9 Periods)

Rank of a matrix: echelon form; Linear systems of equations: solving system of Homogeneous and Non-Homogeneous equations; Eigen values and Eigen vectors of a matrix and properties (without proofs), Diagonalization of matrix by orthogonal transformation; Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

UNIT- V: Linear Algebra-II (Vector Spaces) (9 Periods)

Vector spaces, Linear dependence and independence of vectors, basis, dimension, Linear transformations (maps), range and kernel of a linear map, rank and nullity, inverse of a linear transformation, rank-nullity theorem (without proof), matrix associated with a linear map.

Total Periods: 45

TEXT BOOKS:

1. T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, *Engineering Mathematics-II*, S. Chand & Company, 10th edition, 2016.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th edition, 2017.
3. David Poole, *Linear Algebra: A Modern Introduction*, Brooks/Cole, 2nd edition, 2005.

REFERENCE BOOKS:

1. B.V. Ramana, *Higher Engineering Mathematics*, Tata McGraw hill, 1st edition, 2017.
2. V.Krishna Murthy, Mainra and Arora: *An Introduction to Linear Algebra*, Affiliated East-West Press, 1993.

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I B. Tech. – II Semester

(16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to all Branches of Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE REQUISITE: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z –transforms; partial differential equations.

COURSE OBJECTIVES:

CEO 1 :To impart basic knowledge on Fourier series, Fourier transforms, Laplace transforms, z-transforms and partial differential equations.

CEO 2 :To develop skills in analyzing the problems ,designing mathematical models, Fourier series, Fourier transforms, Laplace transforms, z-transforms and partial differential equations for the problems in engineering.

COURSE OUTCOMES: After completion of the course a successful student is able to

CO 1 :Acquire basic knowledge in
- (a) Fourier series and Fourier transforms
- (b) Fourier integrals
- (c) Laplace transforms and their applications
- (d) z- transforms and their applications
- (e) solving partial differential equations
- (f) Heat transfer and wave motion

CO 2 : Develop skills in analyzing the
- (a) Properties of Fourier series for a given function
- (b) Partial differential equations through different evaluation methods
- (c) Difference equations through z – transforms
- (d) Engineering systems and processes involving wave forms and heat transfer

CO 3 :Develop skills in designing mathematical models for
- (a) Problems involving heat transfer and wave forms
- (b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations

CO 4 :Develop analytical skills in solving the problems involving
- (a) Fourier series and Fourier transforms
- (b) Laplace transforms

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(c) Z-transforms and difference equations
(d) Heat transfer and wave motion

CO 5 : Use relevant transformation techniques for
(a) Obtaining Fourier transforms for different types of functions
(b) Laplace transforms
(c) Z- transforms
(d) Partial differential equations

DETAILED SYLLABUS

UNIT- I : FOURIER SERIES (7 periods)

Fourier series: Determination of Fourier coefficients,convergence of Fourier series (Dirichlet'sconditions),Fourier series of even and odd functions, Half-range Fourier sine and cosine expansions.

UNIT- II: FOURIER INTEGRALSAND FOURIER TRANSFORMS (8 periods)

Fourier integral theorem (statement only), Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms –properties, Inverse transform and finite Fourier transforms.

UNIT-III:LAPLACE TRANSFORMS (12 periods)

Laplace transforms of standard functions. Properties of Laplace transforms. First and second shifting Theorems. Laplace transforms of derivatives and integrals. Inverse transforms. Convolution theorem (without proof), inverse Laplace transforms by convolution theorem. Laplace transform of periodic functions, Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT-IV : Z- TRANSFORMS (9 periods)

Z – transforms, inverse Z– transforms, damping rule, shifting rule, initial and final value theorems. Convolution theorem(without proof), solution of difference equations by Z– transforms.

UNIT – V : PARTIAL DIFFERENTIAL EQUATIONS (9 periods)

Formation of Partial differential equations – Solutions of first order linear equations by method of grouping. First and second order equations by method of separation of variables – Solutions of one dimensional Wave equation, Heat equation.

Total no. of periods: 45

TEXT BOOK:

1. T.K.V. Iyengar, B. Krishna Gandhi,S.Ranganatham and M.V.S.S.N. Prasad,***Engineering Mathematics, vol-1***, S. Chand & Company 13/e,2014.
2. T.K.V. Iyenger, B. Krishna Gandhi, S.Ranganadham and M.V.S.S.N.Prasad,

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Mathematical Methods,S.Chand and Company, 8/e,2013

REFERENCE BOOKS:

1. Grewal, B.S., ***Higher Engineering Mathematics***,Khanna publishers, Delhi, 42/e,2012

2. Kreyszig, E., ***Advanced Engineering Mathematics***,John Wiley and Sons, Inc.,9/e,2013.

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II B. Tech. – II Semester (ECE, EEE and EIE)/

III B. Tech. – I Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)

(19BT4BS01) MATERIAL SCIENCE

(Open Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction to Material Science and Engineering; Composite Materials; Smart Materials; Nano and Biomimetic Materials; Emerging Materials.

COURSE OBJECTIVES:

- To impart knowledge on processing, structure and properties of materials like composite materials, smart materials, biomimetric materials and nanomaterials.
- To develop awareness among the students about the impact of material science in engineering practices.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Attain the basic knowledge on composites, smart materials, biomimetic materials and nano materials.

CO2. Demonstrate essential information about structure and properties of various composites used in various engineering applications.

CO3. Understand the basic properties of electro-rheostatic, magneto-rheostatic and shape memory alloys used in device applications.

CO4. Accomplish the basic knowledge in nanomaterials to familiarize various nano structured device applications.

CO5. Outline the processing and properties of functionally graded materials and identify its applications in various fields.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION TO MATERIAL SCIENCE AND ENGINEERING (08 Periods)

Introduction - historical perspective - material science and engineering, classification of materials (metals, ceramics, polymers and composites) and advanced materials and their

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applications (biomaterials, smart materials and nanomaterials), modern materials needs. Processing, properties and applications of metals, polymers and ceramics (Qualitative).

UNIT- II: COMPOSITE MATERIALS (10 Periods)

Composite Materials - Classification, Laminated composites and Reinforced composite materials – Classification, structure and properties of sandwich composites – applications (commercial Aircraft, Marine Grade Sandwich, Automobile Grade Sandwich and Wind Turbine Blades), properties and applications of Nano composites - Advantages and Limitations of composites.

UNIT- III: SMART MATERIALS (07 Periods)

Classification of smart materials - Magneto-rheostatic (MR) and Electro-rheostatic (ER) materials - Shape Memory Alloys (SMA)- characteristics, Shape memory effect applications in different fields, advances in smart materials.

UNIT – IV: NANO AND BIOMIMETIC MATERIALS (10 Periods)

Nanomaterials: Introduction, Low dimensional structures and energy quantization. Fabrication of nano materials - Lithographic technique using photons, metallic, semiconducting and magnetic properties of nano materials and applications (renewable energy and nano electro-mechanical systems (NEMS)).

Biomimetic materials – Introduction- classification and their applications (Lotus effect, Dolphin sound wave technology and viper as a model in defence)

UNIT- V: EMERGING MATERIALS (10 Periods)

Functionally graded materials (FGM) - Types, processing, properties and potential applications, functionally graded fibre cement – structural material, Functionally Graded Nanoelectronic, Optoelectronic and Thermoelectric Materials (Qualitative) and its applications.

Total Periods: 45

TEXT BOOKS:

1. William D Callister, David G Rethwisch, *Materials Science and Engineering*, Wiley, 9th edition, 2014.
2. K M Gupta, *Engineering Materials – Research, Applications and Advances*, CRC press (Taylor & Francis group), 2015.

REFERENCE BOOKS:

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1. Sulabha K Kulkarni*, Nanotechnology: Principles and practices*, Springer, 9th edition, 2014.

2. Charles P. Poole and Frank J. Owens, *Introduction to Nanotechnology*, Wiley-Interscience, May 2003.

1. Sulabha K Kulkarni, *Nanotechnology: Principles and Practices,* Springer, 3rd edition, 2014.

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II B. Tech. – II Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)/ III B. Tech. – I Semester (ECE, EEE and EIE)

(19BT4HS05) GENDER AND ENVIRONMENT

(Open Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Gender and the environment relationship, Gendered Roles in the family & community, Gender and sustainable development, Gender in environmental justice, Gender &environmental security.

COURSE OBJECTIVES:

- To enhance understanding of environmental issues by considering the particular experiences of women and men in the face of environmental degradation and key areas in gender-environment relations and gender roles in thefamily, community and international levels.
- To trace how different feminisms, build on the core concepts of sustainability and justice to transform familiar debates in global environmental politics.
- To provide analysis of how gender relations affect the natural environment and how environmental issues have a differential impact on women and men.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1: Apply the knowledge of gender & environment connections, key issues and topics within global environmental politics in environmental decision-making.

CO2: Comprehend the concepts of gender and sustainable development through debates, and policy documents.

CO3: Analyze the concept of environmental security and justice by identifying the sources of insecurity.

DETAILED SYLLABUS

UNIT I: GENDER ANDENVIRONMENT RELATIONSHIP (9 Periods)

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Introduction–Gender and Environment–Development of gender roles–Society, gender & environment – Understanding environmental politics – Gender-environment connections–Eco-feminism - Cultural eco-feminism–Social eco-feminism - Feminist political ecology

UNIT II: GENDERED ROLES IN THE FAMILY & COMMUNITY (9 Periods)

Organization of the household – Domestic division of labour - Food: growing, harvesting, shopping, preparing, and cooking
Gender & Power- Planning – Politics – NGO – Gendering of environmental protest – Environmental decision-making

UNIT III: GENDER ANDSUSTAINABLE DEVELOPMENT (9 Periods)

Concept of sustainability & its achievement – Concept of sustainable development – Ecological Modernization – Gender & sustainability debates – Gender & sustainable development debates - Gender in policy documents – Gender, poverty & equity in sustainable development

UNIT IV: GENDER IN ENVIRONMENTAL JUSTICE (9 Periods)

Normative Concerns (Fairness, Inequality & Justice) - Making sense of Environmental justice – Ecological debt, Transnational harm,& human rights – Ecological justice – Gender & Environmental Justice – Gender, Vulnerability & risk – Women in environmental justice movements – Knowledge & participation – Gender, sustainability& justice as guiding concepts

UNITV: GENDER AND ENVIRONMENTAL SECURITY (9 Periods)

Connections between security & the environment – **Gender, environment & security:**Sustainability as security - poverty & insecurity – Insecurity as injustice – Competing ways of thinking security – Reflecting on sources of insecurity – **Case Study** – Food Security -**Case Study** – The impacts of natural disasters

Total Periods: 45

TEXT BOOKS:

1. Nicole Detraz. (2017) "Gender and the Environment"Polity Press, Cambridge, UK.
2. Susan Buckingham- Hatfield. (2000) "Gender and Environment"Routledge, London.

REFERENCE BOOKS:

1. Promillakapur (ed). (2000). "Empowering Indian Women" Publication Division, Government of India, New Delhi.
2. Ronnie Vernooy, (Ed). (2006). "Social and gender Analysis Natural Resource Management: Learnning studies and lessons from Aisa" Sage, New Delhi.

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3. Swarup, Hemlata and Rajput, Pam. (2000). Gender Dimensions of Environmental and Development Debate: The Indian Experience" In SturatS.Nagel, (ed). "India"s Development and Public Policy".Ashgate, Burlington.

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II B. Tech. – II Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)/
III B. Tech. – I Semester (ECE, EEE and EIE)

(19BT4HS09) LIFE SKILLS

(Open Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Positive attitude; Self-discovery-Interpersonal relationships; Cross-cultural communication; Core thinking-Problem solving and Decision making; Business presentations and Public speaking.

COURSE OBJECTIVES:

- To inculcate skills for self-efficacy required to manage effective interpersonal relationships.
- To familiarize the strategies involved in problem solving, decision making and SWOT analysis.
- To develop presentation skills required in professional arena.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Gain knowledge in strategies involved in developing positive attitude, process ofknowing oneself and managing effective interpersonal relationships.

CO2. Analyse problem solving strategies in Decision Making and SWOT analysis.

CO3. Communicate effectively with Engineering Community and Society by demonstrating presentation skills in professional arena.

DETAILED SYLLABUS:

UNIT I: POSITIVE ATTITUDE (9 Periods)

Introduction, Features of attitudes, Formation of attitudes, Ways of changing attitude in a person, Attitude in a work place, Developing positive attitude, Obstacles in developing positive attitude, Measuring attitude.

UNIT II: SELF DISCOVERY AND INTERPERSONAL RELATIONSHIPS (9 Periods)

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Importance of knowing yourself, Process of knowing yourself, SWOT Analysis, Elements of attitude in interpersonal relationships, Methods to deal with different types of interpersonal relationship skills.

UNIT III: CROSS-CULTURAL COMMUNICATION (9 Periods)

Different Communication Styles, Cultural variables, communication sensitivity and variables of national culture, Individual Cultural Variables, Cross-cultural Communication Strategies, Potential hot spots in cross-cultural communication, Cross-cultural communication – Basic Tips.

UNIT IV: CORE THINKING, PROBLEM SOLVING AND DECISION MAKING (9 Periods)

Process of developing core thinking skills, Categories of thinking: Critical & Creative, Understanding problem solving, Cause of problems, Stages of problem solving, Methods of problem solving, Types of decision making.

UNIT V: BUSINESS PRESENTATIONS AND PUBLIC SPEAKING (9 Periods)

Business presentations and speeches, structuring the material, Types of delivery, Guidelines for delivery, Effective sales presentation, Controlling nervousness and stage fright.

Total Periods: 45

TEXT BOOKS:

1. Dr. K. Alex (2018) Soft Skills, S. Chand and Company Limited, New Delhi.

2. Manmohan Joshi (2017) Soft Skills, bookboon.com, Bangalore.

REFERENCE BOOKS:

1. Meenakshi Raman and Prakash Singh (2013), Oxford University Press, New Delhi.

2. Jeff Butterfield (2011) Soft Skills for Everyone, Cengage Learning India Private Limited, Delhi.

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II B. Tech. – II Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)/

III B. Tech. – I Semester (ECE, EEE and EIE)

(19BT4HS11) PROFESSIONAL ETHICS

(Open Elective -2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Engineering Ethics; Professional Ideals and Virtues; Engineering as Social Experimentation; Responsibilities and Rights; Global Issues.

COURSE OBJECTIVES:

- To impart fundamental concepts of engineering ethics, professional values and social responsibility.
- To develop skills in discharging the professional responsibilities as managers, advisors and leaders
- To apply code of ethics in workplace.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in Engineering Ethics, Responsibilities and Rights.

CO2. Analyze the concepts of Engineering in Social Experimentation and Global Issues.

CO3**.** Apply the nuances of professional ideals at work place and in social context.

DETAILED SYLLABUS:

UNIT - I: ENGINEERING ETHICS (9 periods)

Scope and aim of engineering ethics, Senses of engineering ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy-Kohlberg's theory, Gilligan's theory, Consensus and controversy.

UNIT - II: PROFESSIONAL IDEALS AND VIRTUES (8 periods)

Theories about virtues, Professions, Professionalism, Characteristics, Expectations, Professional responsibility, Integrity, Self-respect, Sense of responsibility, Self-interest, Customs and religion, Self-interest and ethical egoism, Customs and ethical relativism, Religion and divine command ethics, Use of ethical theories, Resolving moral dilemmas and moral leadership.

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UNIT - III: ENGINEERING AS SOCIAL EXPERIMENTATION (10 periods)

Engineering as experimentation, Similarities to standard experiments, Learning from the past and knowledge gained, Engineers as responsible experimenters, Conscientiousness, Moral autonomy and accountability, The challenger case, Codes of ethics and limitations, Industrial standards, Problems with the law of engineering.

UNIT - IV: RESPONSIBILITIES AND RIGHTS (9 periods)

Collegiality and loyalty, Respect for authority, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Rights of engineers, Professional rights, Whistle-blowing, The BART case, Employee rights and discrimination.

UNIT - V: GLOBAL ISSUES (9 periods)

Multinational corporations, Professional ethics, Environmental ethics, Computer ethics, Engineers as consultants, Witnesses, Advisors and Leaders, Engineers as Managers, Managerial ethics applied to Engineering Profession, moral leadership.

Total Periods: 45

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, Tata McGraw-Hill, 3rd edition, 2007.
2. Govindarajan, M., Nata Govindarajan, M., Natarajan, S. and Senthilkumar, V. S., *Engineering Ethics*, Prentice Hall of India, 2004.

REFERENCE BOOKS:

1. S. Kannan and K. Srilakshmi, *Human Values and Professional Ethics*, Taxmann Allied Services Pvt Ltd., 2009.
2. Edmund G. Seebauer and Robert L. Barry, *Fundamental of Ethics for Scientists and Engineers*, Oxford University Press, 2001.

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II B.Tech.- II Semester(ECE, EEE and EIE)/
III B.Tech.- I Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)

(19BT4HS12) WOMEN EMPOWERMENT (Open Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:

COURSE DESCRIPTION: Concept & Framework, Status of Women, Women's Right to work, International Women's Decade, and Women Entrepreneurship.

COURSE OBJECTIVES:

- To provide knowledge on the concept and framework for women empowerment, socio-economic political status of the women and develop consciousness among themselves to fight for their rights,
- To witness unprecedented efforts from various sectors to reassess the roles of women, to enlarge the information base, to search for alternative strategies for women's equality and development and to develop policies and programs addressed to women's specific problems and needs.
- To create awareness on women entrepreneurship and schemes for the development of women entrepreneurship and entrepreneurial challenges and opportunities

COURSE OUTCOMES: After successful completion of the course, the students will be able to:

CO1: Demonstrate the characteristics of empowered women, their achievements, and frame work for women empowerment, legal laws, and political status of women.

CO2: Apply the knowledge of women rights to address various societal issues and obstacles in different fields including science and technology.

CO3: Understand the significance of participation in policy debates, National conferences and common forums for women's' equality and development.

CO4: Analyze the concept of women entrepreneurship, government schemes and entrepreneurial challenges and opportunities.

DETAILED SYLLABUS:

UNIT I: CONCEPT & FRAMEWORK (9 Periods)

Introduction- Empowered Women's Characteristics- Achievements of Women's Empowerment **Concept of Empowerment:** Meaning& Concept- Generalizations about Empowerment - Empowerment Propositions - Choices women can make for empowerment - Women's

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participation in decision making, development process & in Governance. **Framework for Women's Empowerment** - Five levels of equality- Tenets of Empowerment- Elements - Phases and aspects - Techniques - Categories and Models – Approaches.

UNIT II: STATUS OF WOMEN (9 Periods)

Legal Status: Present Scenario- Call for Social change- Significant trends - Legal & Schemes - Personal Law- Joint Family- Criminal Law- Shift towards Dowry - Deterrent Punishment - Criminal Law(II Amendment) - Discrimination in Employment

Political Status: Present Scenario - Political Participation & its Nature- Socio-economic Characteristics - Political Mobilization: Mass Media - Campaign Exposure - Group Orientation - Awareness of issues and participation - Progress & Future Thrust.

UNIT III: WOMEN'S RIGHT TO WORK (9 Periods)

Introduction- Present Scenario - Changes in Policy &Programme - National Plan of Action- Women's Cells and Bureau - Increase in work participation rate- Discrimination in labourmarket - Women in unorganized sector - Issues and Obstacles- Women in Education - Women in Science & Technology –

Case Study: Linking Education to Women's Access to resources.

UNIT IV: WOMEN'S PARTICIPATORY DEVELOPMENT (9 Periods)

Dynamics of social change- conscious participation - Information Explosion - Organized Articulation - National Conference - Common Forums - Participatory Development - New Issues Identified - Role of other Institutions.

UNIT V: WOMEN ENTREPRENEURSHIP (9 Periods)

Introduction–Definition-Concept- Traits of women Entrepreneurs- Role of women Entrepreneurs in India -Reasons of Women Entrepreneurship- Government schemes & Financial Institutions to develop Women Entrepreneurs - Key policy recommendations - Project Planning-Suggestions and measures to strengthen women entrepreneurship - Growth & Future challenges - Training and Opportunities –

Case Study: Training Women as Hand-pump Mechanics

Case Study : Literacy for Empowering Craftswomen

Total Periods: 45

TEXT BOOKS:

1. NayakSarojini, Nair Jeevan(2017), "Women's Empowerment in India". Pointer Publishers, Jaipur
2. SahaySushama (2013), "Women and Empowerment" Discovery Publishing House, New Delhi.

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II B. Tech. - II Semester

(19BT40107) SUSTAINABLE ENGINEERING

(Open Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of sustainability; Sustainability metrics and assessment tools; Sustainable engineering practices; Sustainable engineering applications; Sustainable urbanization and industrialization.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Analyze the principles of sustainability to solve complex environmental problems following relevant standards/protocols considering society, health, safety and environment.

CO2. Analyze sustainability metrics and assessment tools to solve complex environmental problems following relevant standards and emerging trends considering society, health, safety, environment and economics besides communicating effectively in graphical form.

CO3. Analyze sustainable engineering practices to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

CO4. Design sustainable engineering applications to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

CO5. Analyze sustainable urbanization and industrialization principles to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT I–PRINCIPLES OF SUSTAINABILITY (9 periods)

Emerging challenges, Sustainability and sustainable engineering; Environmental concerns; Social, economic and legal issues; Availability and depletion of natural resources, Disaster resiliency; Multilateral environmental agreements – Basel convention, Clean development mechanism (CDM), Montreal and Kyoto protocols.

UNIT II–SUSTAINABILITY METRICS AND ASSESSMENT TOOLS (9 periods)

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Sustainability indicators, metrics and assessment tools, Material flow analysis and material budget, Carbon footprint analysis, Life cycle assessment, Streamlined life-cycle assessment (SLCA), Economic input output-life cycle analysis, Environmental health risk assessment, Other emerging assessment tools.

UNIT III–SUSTAINABLE ENGINEERING PRACTICES (9 periods)

Sustainable energy engineering, Sustainable waste management, Green and sustainable buildings and infrastructure, Sustainable civil infrastructure, Sustainable remediation of contaminated sites, Climate geoengineering.

UNIT IV–SUSTAINABLE ENGINEERING APPLICATIONS (9 periods)

Environmental and chemical engineering projects, Materials engineering projects, Infrastructure engineering projects – Background, Methodology, Goal and Scope, Study area, Technical design, Environmental sustainability, Life cycle assessment, Economic sustainability, Social sustainability, Rating systems – ENVISION, LEED, GRIHA, IGBC; Conclusions.

UNIT V–SUSTAINABLE URBANIZATION AND INDUSTRIALIZATION (9 periods)

Sustainable urbanization and industrialization, United Nations sustainable development goals – Right to education, Poverty eradication, Social and technological changes; Industrial Processes - Material selection, Energy efficiency, Pollution prevention and control techniques, Industrial Ecology, Industrial symbiosis.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Reddy, K.R., Cameselle, C., and Adams, J.A., *Sustainable Engineering: Drivers, Metrics, Tools, and Applications*, John Wiley &Sons, Inc., Hoboken, New Jersey, 2019, 544p (ISBN: 978-1-119-49393-8).
2. Allen, D. T. and Shonnard, D. R., *Sustainability Engineering: Concepts, Design and Case Studies*, Pearson Education, 1st Edition, 2012.

REFERENCE BOOKS:

1. Bradley. A.S; Adebayo,A.O., Maria, P.,*EngineeringApplications in Sustainable Design and Developmen*t, Cengage Learning, 1st Edition, 2016.
2. Purohit, S. S., *Green Technology: An Approach for Sustainable Environment*, Agrobios Publication, 1st Edition, 2016.
3. *Energy Conservation Building Code (ECBC) 2007*, Bureau of Energy Efficiency, Govt. of India, New Delhi.

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4. Twidell, J. W. and Weir, A. D., *Renewable Energy Resources*, Routledge, Taylor & Francis Group, 3rd Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Daniel A. Vallero and Chris Brasier, *Sustainable Design: The Science of Sustainability and Green Engineering*, Wiley-Blackwell, 1st Edition, 2008.
2. Jorge A. Vanegas, *Sustainable Engineering Practice: An Introduction*, Committee on Sustainability, American Society of Civil Engineers, https://doi.org/10.1061/9780784407509, 2004.
3. Mackenthun, K.M., *Basic Concepts in Environmental Management*, CRC Press, Taylor & Francis Group, 1st Edition, 1999.
4. *Environment Impact Assessment Guidelines*, Notification of Government of India, 2006.

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I B. Tech. – I Semester

(19BT10501) PROGRAMMING FOR PROBLEM SOLVING

(Common to CE, ME, CSE, CSSE, IT, CSE (AI) and CSE (DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES: A course on Basic Mathematics

COURSE DESCRIPTION: Introduction to problem solving approach, Introduction to Python programming, control structures, sequences, sets, Dictionaries, Implementation of Data structures using Python, Modular programming, file handling, Data representation and Visualization.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on Python constructs to solve basic problems.

CO2. Develop and use Python modules to provide solutions to problems.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO PROBLEM SOLVING AND PYTHON PROGRAMMING **(10 Periods)**

Problem Solving Aspect: top-down design, implementation of algorithms, building blocks of flow charts, program verification and efficiency of algorithms.

Python Programming: tokens, literals, identifiers, keywords, special symbols and operators; fundamental data types, expressions, type conversions, handling Input and output in Python.

UNIT-II: CONTROL STRUCTURES **(8 Periods)**

Selection Statements: if statement, if-else statement, if-elif-else statement, nested-if statement.

Iterative Statements: while loop, for loop, break statement, continue statement, pass and else statements used with loops.

UNIT-III: SEQUENCES, SETS, DICTIONARIES AND DATA STRUCTURES **(9 Periods)**

Sequences: Lists and operations - creating, inserting elements, updating elements, deleting elements, searching and sorting, list comprehensions, nested lists; **tuples -** creating, searching and sorting, nested tuples; **strings -** Initializing a string and string operations, string handling methods, string formatting; **sets -** set creation and operations; **dictionaries -** operations on dictionaries, dictionary methods, sorting elements using lambdas.

Data structures: Stacks - push, pop, peek and display operations on stack, applications of stack; **Queues –** enqueue, dequeue and display operations on queue, applications of queues.

UNIT-IV: MODULAR PROGRAMMING AND FILE HANDLING (10 Periods)

Modular Programming: need for functions, function definition, function call, variable scope and lifetime, return statement, positional arguments, keyword arguments, default arguments and variable-length arguments, recursive functions; Modules - math, NumPy, date and time.

File Handling: types of files, opening and closing files, reading and writing data.

UNIT-V: DATA REPRESENTATION AND VISUALIZATION (8 Periods)

Pandas: creating data frame, reading data from CSV files, indexing and selecting data, dealing with rows and columns; Visualization - bar plots, histogram, Scatter Plot.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. R. Nageswara Rao, *Core Python Programming,* 2nd edition, Dreamtech Press, 2018.
2. R. G. Dromey, *How to solve it by Computer,* Pearson, 2006.

REFERENCE BOOKS:

1. Reema Thareja, *Python Programming using Problem Solving Approach*, 1st edition, Oxford University Press, 2017.
2. Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem-Solving Focus*, Wiley India, 2016.

II B. Tech. – I Semester

(16BT30503) PYTHON PROGRAMMING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES:
A Course on "Object Oriented Programming through C++"

COURSE DESCRIPTION:
Data types and Expressions; Control Statements; Strings; Text Files; Lists; Dictionaries; Functions; Objects and their use; Exception Handling; Design with Classes; Graphical User Interface;

COURSE OUTCOMES:
On successful completion of the course, students will be able to:
CO1. Demonstrate knowledge in:
- Data Types, Variables, Expressions
- Control statements, Strings and Text files.
- Lists, Dictionaries and Functions.
- Objects and Design with classes
- Exception Handling and GUI

CO2. Analyze complex computational problems.
CO3. Design solutions for real life computational problems
CO4. Solve complex problems using python scripting constructs.
CO5. Implement python scripts using Integrated Development Environment.
CO6. Apply Python programming knowledge to solve problems related to societal applications like Medical and Weather Forecasting.

DETAILED SYLLABUS:
UNIT- I: INTRODUCTION, DATA TYPES AND EXPRESSIONS (8 periods)
Introduction: Computer science, Computer algorithms, Computer software, The Python programming language, First program in Python.
Data Types and Expressions: Literals, Variables and Identifiers, Operators, Expressions and Data types.

UNIT- II: CONTROL STRUCTURES, LISTS, DICTIONARIES AND SETS (8 periods)
Control Structures: Control structures, Boolean expressions, Selection control and Iterative control.
Lists: List structures, Lists in Python, Iterations over lists, Assigning and copying lists, List comprehensions.

Dictionaries, Tuples and Sets: Dictionary types in Python, Implementation of Dictionary, Tuples, Set data type - the Set data type in Python, Implementation of sets.

UNIT-III: DESIGN WITH FUNCTIONS, STRINGS AND TEXT FILES (9 periods)

Program routines, Functions, Recursion-Recursive functions, Recursive problem solving, Iteration Vs Recursion, A case study of Towers of Hanoi using recursion; Using text files, String processing, Exception handling, A Case study on cigarette Use/ Lung cancer Correlation program.

UNIT-IV: OBJECTS AND THEIR USE, OBJECT ORIENTED PROGRAMMING (9 periods)

Objects and Their Use: Software objects, Turtle graphics-Creating a turtle graphics window, The default turtle, Fundamental turtle attributes and behavior, Additional turtle attributes, Creating multiple turtles.

Object Oriented Programming: Encapsulation, Inheritance, and Polymorphism.

UNIT-V: GUI PROGRAMMING (11 periods)

Tkinter Overview - tkinter pragmatics, Documentation, Extensions, structure; tkinter coding alternatives, adding buttons and callbacks-lambda, bound method, callable class object, Binding events; adding multiple widgets, Reusable GUI Components with classes, Dialogs, Entry, check buttons and Radio buttons, Scales, Menus.

Total Periods: 45

TEXT BOOKS:

1. Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem-Solving Focus*, Wiley India Edition, 2016.
2. Mark Lutz, "Programming Python," O'Reilly Publications, Fourth Edition, 2011.

REFERENCE BOOK:

1. Kenneth Lambert and B.L. Juneja, *Fundamentals of Python,* Cengage Learning, Third Edition, 2012.

I B. Tech. – I Semester

(19BT10531) PROGRAMMING FOR PROBLEM SOLVING LAB

(Common to CE, ME, CSE, CSSE, IT, CSE (AI) and CSE (DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: A course on Basic Mathematics

COURSE DESCRIPTION: The course is designed to provide hands on practice on Scratch programming and python programming for problem solving.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Develop scripts using Scratch tool to simulate simple problems.

CO2. Apply Python Constructs and Modules to develop solutions for real-life problems.

CO3. Function effectively as an individual and in team to foster knowledge and creativity.

CO4. Write and present a substantial technical report/ document effectively.

PRACTICAL EXERCISES:

1) a) Design a script in Scratch to simulate Airplane for take-off and land.

   b) Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result.

2) a) Design a script in Scratch to calculate factorial of a given number.

   b) Design a script in Scratch to simulate Maze game. (Hint: To get Maze images refer http://inventwithScratch.com/downloads/)

3) a) Write a python script to read two integer numbers and perform arithmetic operations.

   b) Write a python script to evaluate following expressions by considering necessary inputs.

   i) $ax^2 + bx + c$ ii) $ax^5 + bx^3 + c$ iii) (ax + b) / (ax - b) iv) x - a / b + c

4) a) Write a python script to convert given decimal number into octal, hexa decimal and binary.

   b) Write a python script to read four integer values separated with commas and display the sum of those four numbers.

   c) Write a python script to print "SVEC" with prefix of ten spaces by using format().

5) a) Write a python script to calculate electricity bill based on following slab rates.

Consumption units	Rate (in Rupees/Unit)
0-100	4
101-150	4.6
151-200	5.2
201-300	6.3
Above 300	8

(Hint: To get Consumption units take current Meter reading, old meter reading from the user as input)

b) Print the following pattern using python script.

```
                1
            1   2   1
        1   2   3   2   1
    1   2   3   4   3   2   1
1   2   3   4   5   4   3   2   1
```

6) a) Write a python script to read *N* student details like name, roll number, branch and age. Sort the student details based on their names and display.

b) Write a python script to delete duplicate strings from a list of strings. (Insertion order should maintain after deleting duplicate string).

c) Write a python script to read N number of student details into nested list and convert that as a nested dictionary.

7) a) Design a function that can perform sum of two or three or four numbers.

b) Write a python script to implement towers of Hanoi problem.

c) Write a Python function primesquare(l) that takes a nonempty list of integers and returns True if the elements of l alternate between perfect squares and prime numbers, and returns False otherwise. Note that the alternating sequence of squares and primes may begin with a square or with a prime. Here are some examples to show how your function should work.

```
>>>primesquare([4])
True
>>>primesquare([4,5,16,101,64])
True
>>>primesquare([5,16,101,36,27])
False
```

8) a) Write a python script to perform arithmetic operations on numpyarrays.

b) Write a python script to perform following matrix operations using numpy.

i) Dot product ii) Matrix product iii) Determinant iv) Inverse

9) a) Write a python script to Create Pandas dataframe using list of lists.

b) Write a python script to load data from a CSV file into a Pandas DataFrame and perform basic operations on it.

10) a) Draw a Scatter Plot by considering an appropriate data set.

b) Draw histograms by considering an appropriate data set.

11) Mini Project-1

12) Mini Project-2

TEXT BOOK:

1. R. Nageswara Rao, *Core Python Programming*, 2nd edition, Dreamtech Press, 2018.

II B. Tech. – I Semester
(16BT30532) PYTHON PROGRAMMING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PRE-REQUISITES:
A Course on "Python Programming"

COURSE DESCRIPTION:
Hands on practice – Scripting using Python Programming constructs; Conditional statements; Loops; Text Files; Lists; Dictionaries; Strings; Functions; GUI.

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

CO1. Demonstrate practical knowledge of using python scripting constructs:
- Selection and Repetition statements.
- Lists, Dictionaries, Strings and Functions.
- Text Files and GUI.

CO2. Analyze the complexity of computer hardware.
CO3. Design solutions for specified computational problems using Object Oriented Programming concepts
CO4. Use appropriate python scripts and functions for solving complex problems.
CO5. Create window based applications using tkinter package
CO6. Apply contextual knowledge to computational problems related to societal applications like Medical and Weather Forecasting.
CO7. Work effectively to contribute individually to solve real world problems.
CO8. Communicate effectively in both oral and written to develop Python scripts.

LIST OF EXERCISES:

1. a. Write a python script to display a simple message
   b. Write a python script to perform basic arithmetic operations on two values which are accepted from the user.
2. a. Write a python script to calculate the factorial of a given number.
   b. Write a python script to calculate sum of individual digits of a given number.
   c. Write a python script to display the prime number series up to the given N Value.

3. a. Write a python script to find the largest number among three numbers and display them in ascending order using if-else construct.
   b. Write a python script to create a simple text file, write the contents into the created file and display the same on to the console screen.
4. Write a python script to remove all the occurrences of a given character from a text file, copy the resultant text into another text file. Find the total occurrences of the eliminated characters and display the count along with the contents of the text file on to the console.
5. a. Write a python script to display Fibonacci sequence of numbers using while loop, for loop and do-while loop constructs.
   b. Write a python script to demonstrate string methods.
6. a. Write a python script to create a list and add n number of user-defined values to the list and display the same on to the console screen.
   b. Write a python script to perform the following operations on Lists:
   (i) Matrix Addition.
   (ii) Matrix Multiplication.
7. a. Write a python script to search a key element in the given list of elements.
   b. Write a python script to arrange the given list of elements in ascending or descending order.
8. a. Write a python script to find GCD of two numbers using recursive and non recursive functions.
   b. Write a python script to convert the following using functions:
   (i) Fahrenheit to Celsius temperature.
   (ii) Celsius to Fahrenheit temperature.
9. a. Write a python script to draw a square using setposition method in absolute positioning.
   b. Write a python script to draw a triangle using left, right and Forward methods in relative positioning.
   c. Write a python script using penup and pendown methods to draw "W" character using turtle graphics.
   d. Write a python script to create your own polygon shape and create an interesting design with it.

10. a. Write a GUI Script for creating text label in a window.
    b. Write a Python Script to create a command button. When the button is clicked the event should be handled and the message on the window should change from "Hello" to "Good Bye".
11. a. Write a python script to demonstrate the Exception Handling.
    b. Write a Python script to demonstrate the Mouse and Key Event handling.
    c. Write a python script to demonstrate menu-driven applications
12. By forming a group of 3 to 4 members develop a mini-project for Horse Race Simulation with the help of GUI programming and tkinter package.

REFERENCE BOOKS:

1 Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem-Solving Focus,* Wiley India Edition, 2016.
2. Mark Lutz, *Programming Python,* O'Reilly Publications, Fourth Edition, 2011.

Greedy Method: General method, Applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest paths.

UNIT-IV: DYNAMIC PROGRAMMING AND BACK TRACKING (10 Periods)

Dynamic Programming: General Method, Applications - Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem.

Back Tracking: General Method, Applications – N Queen problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles.

UNIT-V: BRANCH AND BOUND TECHNIQUES (8 Periods)

General method, Applications - Travelling sales person problem, 0/ 1 knapsack problem; LC Branch and Bound solution, FIFO Branch and Bound solution.

Total Periods: 45

TEXT BOOK:

1. Ellis Horowitz, Satraj Sahni and Rajasekharam, *Fundamentals of Computer Algorithms,* Galgotia Publications Pvt. Ltd, New Delhi, Second Edition, 2007.

REFERENCE BOOKS:

1. M. T. Goodrich and R. Tomassia, *Algorithm Design: Foundations, Analysis and Internet Examples,* John Wiley and Sons, 2002.
2. S. Sridhar, *Design and Analysis of Algorithms,* Oxford Press, 2015.
3. Harsh Bhasin, *Algorithms: Design and Analysis,* Oxford University Press, 2015.

II B. Tech. - II Semester

(19BT40532) DATABASE MANAGEMENT SYSTEMS LAB

(Common to CSE, CSSE, IT, CSE (AI), CSE (DS) and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: A course on "Database Management Systems"

COURSE DESCRIPTION:

Design of an ER Models; Hands-on experience on - DDL, DML commands, Query processing using operators, Joins, Views, Synonyms, Indexes, Single row functions, Group functions and Set functions; PL/SQL programming - Basic programs, Exception handling, Triggers, Functions, Cursors and Stored procedures.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Analyze the requirements of a given database problem and design viable ER-Models for implementation of database.

CO2. Create database schemas, select and apply suitable integrity constraints for querying databases using SQL interface.

CO3. Develop and interpret PL/SQL blocks to centralize database applications for maintainability and reusability.

CO4. Develop database applications for societal applications such as ticket reservation system, employee payroll system using modern tools.

CO5. Work independently and communicate effectively in oral and written forms.

LIST OF EXERCISES:

1. Design and analyze an ER Model for the following use case.

   Roadway Travels" is in business since 1977 with several buses connecting different places in India. Its main office is located in Hyderabad. The company wants to computerize its operations in the following areas:

   - Reservations
   - Ticketing
   - Cancellations

   Reservations:

   Reservations are directly handled by booking office. Reservations can be made 60 days in advance in either cash or credit. In case the ticket is not available, await listed ticket is issued to the customer. This ticket is confirmed against the cancellation.

   Cancellation and Modification:

   Cancellations are also directly handed at the booking office. Cancellation charges will be charged. Waitlisted tickets that do not get confirmed are fully refunded.

2. a) Implement Data Definition Language commands -Create, Alter, Drop, Truncate, and Rename.

   b) Implement Data Manipulation Language commands - Insert, Select, Update,

and Delete.

c) Implement Single Row functions - Character, Numeric and Date functions.

3. Implement various types of integrity constraints - NOT NULL constraint, DEFAULT constraint, UNIQUE constraint, PRIMARY key, FOREIGN key, CHECK constraint.

4. a) Implement group functions with different operators such as aggregate operators, group by, having and order by.

b) Implement nested and correlated nested queries using set operators and set comparison operators.

5. a) Creation of views, synonyms, sequence, indexes and save point.

b) Implement various types of joins - outer join and inner join.

Basic PL/SQL:

6. Construct PL/SQL block for the following.

a) To determine whether a number is palindrome

b) To determine whether a number is an Armstrong number

c) To find greatest of three numbers

d) To display Fibonacci series

Control Structures:

7. a) Write a program in PL/SQL to update the salary of a specific employee by 8% if the salary exceeds the mid-range of the salary against this job and update up to mid-range if the salary is less than the mid-range of the salary, and display a suitable message.

b) Write a PL/SQL program to display the description against a student's grade using CASE statement.

Exception Handling:

8. a) Develop a PL/SQL program that displays the name and address of a student whose ID is given. If there is no student with the given student ID in the database, the program should raise a run-time exception NO_DATA_FOUND, which should be captured in the EXCEPTION block.

b) Construct the user-defined exceptions to get the salary of an employee and check it with the job's salary range. If the salary is below the range, raise an exception BELOW_SALARY_RANGE. If the salary is above the range, raise the exception ABOVE_SALARY_RANGE.

Functions:

9. a) Write a function that accepts two numbers A and B and performs the following operations.

- Addition
- Subtraction

- Multiplication
- Division

b) Write a PL/SQL block that updates salary of an employee in Employee table by using incr function which takes employee number as argument and calculates increment and returns increment based on the following criteria.

If salary <= 3000, increment = 30% of salary

If salary > 3000 and <= 6000, increment = 20% of salary

else increment = 10% of salary

Procedures:

10. a) Write a procedure that accepts two numbers and displays their sum.

    b) Write procedures to demonstrate IN, IN OUT and OUT parameters.

Cursors:

11. a) Write a block in PL/SQL to create a Cursor that displays the employee name and number of jobs he or she has done in the past.

    b) Write a program in PL/SQL to create a cursor to display the name and salary of each employee in the EMPLOYEES table whose salary is less than that specified by a passed-in parameter value.

Triggers:

12. Develop a suitable student database application by considering appropriate attributes.

    Couple of attributes to be maintained is the attendance of a student in each subject for which he/she has enrolled and internal assessment Using TRIGGERS for the following

    a) Whenever the attendance is updated, check if the attendance is less than 85%; if so, notify the concerned head of the department.

    b) Whenever, the marks in an internal assessment test are entered, check if the marks are less than 40%; if so, notify the concerned head of the department.

REFERENCE BOOKS:

1. Satish Ansani, *Oracle Database 11g: Hands-on SQL and PL/SQL*, PHI, 2010.
2. Pranab Kumar Das Gupta, P. Radha Krishna, *Database Management System Oracle SQL and PL/SQL*, PHI, 2nd Edition, 2009.

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II B. Tech. II Semester

(16BT40531) DATABASE MANAGEMENT SYSTEMS LAB

(Common to CSE, IT and CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PRE-REQUISITES:
A course on "Database Management Systems"

COURSE DESCRIPTION:
Hands on experience on - DDL, DML commands; Query processing using operators; Joins, Views, Single Row functions, Group Functions and SET functions; PL/SQL concepts - Basic Programs, Triggers, Functions, Cursors and Stored Procedures.

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

CO1. Demonstrate practical knowledge on creation and alteration of tables, insertion and Querying of data.
CO2. Analyze and evaluate the databases using SQL DML/DDL commands.
CO3. Design database schemas for the sales database, customer database and product database.
CO4. Develop solutions for database problems using stored procedures, stored functions, cursors and triggers.
CO5. Implement DDL and DML commands in SQL and PL/SQL, ORACLE to manage data in databases.
CO6. Apply contextual knowledge to develop database applications related to societal applications like Information Retrieval Systems, Banking and Financial systems.
CO7. Demonstrate communication skills, both oral and written for preparing and presenting reports on databases.

DESCRIPTION OF SALES DATABASE:
ABC is a company operating in the country with a chain of shopping centers in various cities. Everyday large numbers of items are sold in different shopping centers. The Sales database comprises of various tables like CUST, PROD, SALES_DETAIL, STATE_NAME with the following schemas.

CUSTOMERS Name	Type	Remark
CID	VARCHAR2(6)	PRIMARY KEY
CNAME	VARCHAR2(10)	
CCITY	VARCHAR2(8)	
PRODUCTS		
Name	**Type**	**Remark**
PID	VARCHAR2(6)	PRIMARY KEY
PNAME	VARCHAR2(6)	
PCOST	NUMBER(5,2)	
PROFIT	NUMBER(3)	
SALES DETAILS		
Name	**Type**	**Remark**
CID	VARCHAR2(6)	COMPOSITE PRIMARY KEY
PID	VARCHAR2(6)	COMPOSITE PRIMARY KEY
SALE	NUMBER(3)	
SALEDT	DATE	COMPOSITE PRIMARY KEY
STATES		
Name	**Type**	**Remark**
CCITY	VARCHAR2(8)	PRIMARY KEY
STATE	VARCHAR2(15)	

LIST OF EXERCISES:

1. Execute: Data Definition Language (DDL) commands

I. Create the tables in sales database.

II. View the structure of the each table.

III. Change the structure of the table like add new column, change the width of a data type, change the data type of a column, delete column from the table, rename the column name and table names.

IV. Delete all records stored in a table, but the structure of the table is retained.

V. Remove a table from the database.

2. Execute: Data Manipulation Language (DML) commands

STATES PRODUCTS

CCITY	STATE
Mysore	Karnataka
Kolkata	Westbengal
Pune	Maharashtra
Tirupathi	Andhra Pradesh
Chennai	Tamilnadu

CUSTOMERS SALES DETAILS

PID	PNAME	PCOST	PROFIT
p1	pen	100	10
p2	pencil	15.5	2
p3	pendrive	950	50
p4	DVD	35	5
p5	mouse	500.5	Null

CID	CNAME	CCITY
c1	gopal	mysore
c2	haitvik	kolkata
c3	rohan	pune
c4	rajini	chennai
c5	mohan	tirupathi
c6	sanjay	mysore
c7	samhita	Kolkata

CID	PID	SALE	SALEDT
c1	p1	10	1-Sep-16
c2	p3	20	18-Mar-17
c5	p5	30	20-Dec-16
c3	p2	45	1-Sep-16
c4	p4	15	1-Sep-16
c7	p3	22	18-Mar-17
c1	p2	23	1-Sep-16
c2	p1	33	14-Jul-17
c3	p5	14	18-Mar-17
c6	p4	10	14-Jul-17
c1	p2	5	18-Mar-17
c4	p2	50	18-Mar-17
c5	p1	20	14-Jul-17
c3	p3	9	1-Sep-16
c6	p5	10	18-Mar-17
c3	p4	8	20-Dec-16
c7	p3	6	1-Sep-16
c1	p5	9	14-Jul-17

I. Write a query to display all customers.
II. Write a query to display pname of all products.
III. Write a query to display cname and ccity of all customers.
IV. Write a query to display cname, ccity of all customers who lives in mysore.
V. Write a query to display cname and ccity of all customers who live in Kolkata or Chennai.
VI. Find the cost of pencil.
VII. Display CID as Customer_Id, CNAME as Name for all customers.
VIII. Change the name of the product p3 from 'pendrive' to 'modem'.
IX. Find the product ids in sales detail table (eliminating duplicates).
X. Remove the record from sales detail table whose sale value is 5.

3. Implement table level and Column level constraints like NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, CHECK, DEFAULT.

4. Operators

I. Display the sum of pcost and profit of all products.
II. Display the column heading as "Selling Price" instead of PCOST+PROFIT.
III. Find out what percent of pcost is profit for all products.
IV. List the cids of customers who purchased products on '14-jul-2017'.
V. List only the products whose cost is more than 50.00.
VI. List all the customers who are not belongs to 'pune'.
VII. Write a query to display the pname and pcost of all the products where pcost lies between 5 and 25.
VIII. Write a query to display distinct customer id where product id is p3 or sale date is '18-mar-2017'.
IX. Write a query to display cname, ccity of those customers whose cid is in c1 or c2 or c4 or c5 (using IN operator).
X. List customers whose name starts with 'h'.
XI. Write a query to display all records of prod table in which first and third character of pname is any character and second character is 'e'.

XII. Write a query to display all cname which includes two 'a' in the name.
XIII. List the products with unknown profit.
XIV. Display the profit of products as zero if unknown.

5. Joins and Views

I. Write a query to display cname, pname, sale, saledt for all customers.
II. Write a query to display cname who have purchased Pen.
III. Write a query to display cname, pname, sale for all customers who sold after '01-sep-2016'.
IV. Write a query to display cname,ccity,state of all customers.
V. Write a query to display cname,ccity of all customers who belongs to Karnataka.
VI. Create a view on product table which includes pid, pname and pcost of products.
VII. Insert a row into the view.
VIII. Update the rows in a view.
IX. Delete the rows from view.

6. Order by, group by and having clauses.

I. Write a query to display pname of all records. Sort all records by pname. (use order by clause)
II. Write a query to display cname and ccity of all records. Sort by ccity in descending order.
III. Write a query to display saledt and total sale on the date.
IV. Write a query to display saledt and total sale on the date labeled as sale of all items.
V. Write a query to display saledt and total sale on the date sold after 01-sep-2016.
VI. Write a query to display saledt and total sale on the date labeled as sale of all items other than DVD.
VII. Write a query to display total number of customers who purchase pen.

7. Single Row Functions: Date Function, Numeric and Character Function

I. Write a query to display system date
II. Write a query to display the system date by rounding it to next month.
III. Write a query to display the system date by rounding it to next year.
IV. Write a query to display the last date of the system date.
V. Write a query to display the next date of system date which is Friday.

VI. Write a query to display sale date and date after 02 months from sale date.
VII. Write a query to display system date, sale date and months between two dates.
VIII. Write a query to display the greatest date between sale date and system date, name it as BIG, also display sale date and SYSDATE.
IX. Write a query to display the least date between sale date and system date name it as SMALL, also display sale date and SYSDATE.
X. Write a query to display the product name along with the rounded value of product cost for product name is "Pencil".
XI. Write a query to display product cost along with MOD value if divided by 5.
XII. Write a query to display cname in uppercase, lowercase, titlecase from cust table where customer name is "rohan".
XIII. Write a query to display all concatenated value of cname, ccity by converting cname into titlecase and ccity into uppercase.
XIV. Write a query to display the first 3 characters of cname.
XV. Write a query to display the position of 'm' in the cname of the customer whose name is "samhita".
XVI. Write a query to display the length of all customer names.
XVII. PAD # character in left of product cost to a total width of 5 character position.

8. Group Functions and Set Functions

I. Write a query to display the total count of customer.
II. Write a query to display the minimum cost of product.
III. Write a query to display average value of product cost rounded to 2nd decimal places.
IV. Write a query to display product name with total sale detail in descending order.
V. Write a query to display product name, sale date and total amount collected for the product.
VI Write a query to display sale date and total sale date wise which was sold after "14-jul-2016".
VII. Write a query to display the customer name who belongs to those places whose name is having 'i' or 'p'.

VIII. Write a query to display customer name who belongs to a city whose name contains characters 'c' and whose name contains character 'a'.

IX. Write a query to display the customer name who does not belong to 'pune'.

9. PL/SQL basic programs

I. Write a PL/SQL program to find largest number among three. (Hint: Use Conditional Statement)

II. Write a PL/SQL program to display the sum of numbers from 1 to N using for loop, loop...end and while...loop.

10. SQL Cursor based programs

I. Write a PL/SQL program to display the costliest and cheapest product in PROD table.

II. Write a PL/SQL program which will accept PID and display PID and its total sale value i.e. sum.

11. Functions

I. Write a function that accepts two numbers A and B and performs the following operations.
   a. Addition
   b. Subtraction
   c. Multiplication
   d. Division

II. Write a function that accepts to find the maximum PCOST in PROD table.

12. Procedures

I. Write a procedure that accepts two numbers A and B, add them and print.

II. Write procedures to demonstrate IN, IN OUT and OUT parameter.

13. Triggers

I. Develop a PL/SQL program using BEFORE and AFTER triggers.

II. Create a row level trigger for the PROD table that would fire for INSERT or PDATE or DELETE operations performed on the PROD table. This trigger will display the profit difference between the old values and new values.

REFERENCE BOOKS:

1. Satish Ansari, *Oracle Database 11g: Hands-on SQL and PL/SQL,* PHI Publishers, 2010.
2. Pranab Kumar Das Gupta, Data Base Management System; Oracle; SQL and DL/SQL, PHI Learhi, Private Limited, 2009.

II B. Tech. – I Semester

(19BT31202) SOFTWARE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Concepts of Software Engineering; Software Process Models; Conventional and Agile Process Models; Software Requirements Engineering Process; System Analysis; Architectural Design; User Interface Design and Re-engineering; Software Testing; Risk and Quality Management.

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

CO1. Understand fundamental concepts of software engineering and analyze process models required to develop a software system.

CO2. Analyze software requirements and model requirements for the given scenario.

CO3. Apply design concepts and metrics for software development.

CO4. Apply testing strategies and techniques for quality software.

CO5. Analyze risks in software development life cycle and apply risk strategies to mitigate risks.

DETAILED SYLLABUS:

UNIT I: SOFTWARE ENGINEERING AND SOFTWARE PROCESS (11 periods)

A Generic view of process: The Nature of Software, Software Engineering- Software Engineering Layers; The Software Process, Software Engineering Practice, Software myths.

Process models: A Generic Process Model, Prescriptive Process Models-The Waterfall Model, Incremental Process Models, Specialized Process Models; The Unified Process, Agile Development-Agility, Agile Process, Extreme Programming (XP), Scrum, Dynamic System Development Method,Agile Modeling (AM), Agile Unified Process (AUP).

UNIT II: REQUIREMENTS ENGINEERING AND MODELING (07 periods)

Requirements Engineering: Functional and non-functional requirements, the software requirements document, Requirements specifications, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management.

Requirements Modeling: Requirements Analysis, Data Modeling Concepts, Flow-Oriented Modeling,Scenario based Modeling, UML Models that supplement the Use Case, Case study on Requirements modeling for Web and MobileApps.

UNIT III: DESIGN ENGINEERING AND METRICS (09 periods)

Design using UML: Design concepts, Software Architecture, Architectural Styles, Class Diagram - Terms and concepts, Use case Diagram - Terms and concepts, Activity Diagrams - Terms and concepts, Interaction diagrams - Terms and concepts, Statemachine Diagram- Terms and concepts, Component Diagram- Terms and concepts, Deployment Diagram- Terms and concepts.

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Process and Project Metrics: Metrics in the process and project domains, Software Measurement, Metrics for software quality.

UNIT IV: SOFTWARE TESTING STRATEGIES AND APPLICATIONS (08 periods)

Testing strategies: A strategic approach to software testing, Strategic issues, Test strategies for conventional software, Test strategies for object oriented software, Validation testing, System testing, The art of debugging.

Testing Conventional Applications: Software testing fundamentals, White box testing-Basis path testing, Control structure testing; Black box testing, Object oriented testing methods.

UNIT V: RISK, QUALITY MANAGEMENT AND REENGINEERING (10 periods)

Risk and Quality Management: Reactive and Proactive risk strategies, Software risks, Risk Mitigation Monitoring and Management (RMMM), RMMM plan, Formal Technical Reviews (FTR), Software Quality Assurance (SQA)-Tasks, Goals and Metrics; Software reliability.

Reengineering: Introduction, Business Process Reengineering (BPR), Software Reengineering, Restructuring, Reverse engineering, Forward engineering.

Total Periods: 45

Topics for self-study shall be included in lesson plan.

TEXT BOOKS:

1. Roger S. Pressman, *Software Engineering - A Practitioner's Approach,* McGraw-Hill International Edition, Eigth Edition, 2015.
2. Ian Sommerville, *Software Engineering*, Pearson Education, Ninth Edition, 2011.

REFERENCE BOOKS:

1. Grady Booch, James Rum Baugh and Ivar Jacobson, "The Unified Modeling Language User Guide," Second Edition, Pearson Education, 2009.
2. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers, Third Edition, 2007.
3. ShelyCashman Rosenblatt, *Systems Analysis and Design*, Thomson Publications, Sixth Edition, 2006.

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II B.Tech. - II Semester
(16BT41203) SOFTWARE ENGINEERING
(Common to CSE, IT and CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Concepts of Software Engineering; Software Process Models; Conventional and Agile Process Models; Software Requirements Engineering Process; System Analysis; Architectural Design; User Interface Design and Re-engineering; Software Testing; Risk and Quality Management.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on:
- Fundamental concepts of software engineering.
- Process models.
- Software development life cycle.

CO2. Analyze software requirements and process models required to develop a software system.

CO3. Design and develop a quality software product using design engineering principles.

CO4. Develop software product as per user and societal requirements.

CO5. Follow standards for software development and quality management.

CO6. Demonstrate skills in applying risk and quality management principles for effective management of software projects.

DETAILED SYLLABUS:

UNIT I: SOFTWARE ENGINEERING AND SOFTWARE PROCESS (11 Periods)

A Generic View of Process: The nature of software, Software engineering- Software engineering layers; The software process, Software engineering practice, Software myths.

Process Models: A Generic process model, Incremental process models, Evolutionary Process models; The unified process, Agile

Development-Agility, Agile process, Scrum, Agile modeling (AM), Agile Unified Process (AUP), The Cleanroom strategy.

UNIT II: REQUIREMENTS ENGINEERING AND MODELING (7 Periods)

Requirements Engineering: Functional and non-functional requirements, The software requirements document, Requirements specifications, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management.

Requirements Modeling: Data modeling concepts, Flow-oriented modeling, Case study on requirements modeling for WebApps.

UNIT III: DESIGN ENGINEERING AND METRICS (8 Periods)

Design Engineering: Design within the context of software engineering, The Design process, Design concepts, Software architecture, Architectural styles, Architectural design.

Process and Project Metrics: Metrics in the process and project domains, Software measurement, Metrics for software quality.

UNIT IV: SOFTWARE TESTING STRATEGIES AND APPLICATIONS (9 Periods)

Testing Strategies: A strategic approach to software testing, Strategic issues, Test strategies for conventional software, Test strategies for object oriented software, Validation testing, System testing, The art of debugging.

Testing Conventional Applications: Software testing fundamentals, Basis path testing, White box and Black box testing, Object oriented testing methods.

UNIT V: RISK, QUALITY MANAGEMENT AND REENGINEERING (10 Periods)

Risk and Quality Management: Reactive and proactive risk strategies, Software risks, Risk Mitigation Monitoring and Management (RMMM), RMMM plan, Software quality factors, Defect amplification Model, Formal Technical Reviews (FTR), Software Quality Assurance (SQA)-Tasks, Goals and metrics;

Software reliability.

Reengineering: Introduction, Business Process Reengineering (BPR), Software reengineering, Restructuring, Reverse engineering, Forward engineering.

Total Periods: 45

TEXT BOOKS:

1. Roger S. Pressman, *Software Engineering-A Practitioner's Approach,* McGraw-Hill International Edition, Seventh Edition, 2010.
2. Ian Sommerville, *Software Engineering,* Pearson Education, Ninth Edition, 2011.

REFERENCE BOOKS:

1. K. K. Aggarwal and Yogesh Singh, *Software Engineering, New Age International Publishers,* Third Edition, 2007.
2. Shely Cashman Rosenblatt, *Systems Analysis and Design, Thomson Publications,* Sixth Edition, 2006.

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II B. Tech. – I Semester

(19BT31232) SOFTWARE ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: A Course on Software Engineering.

COURSE DESCRIPTION: Software Development Life Cycle activities-requirements specification, SRS preparation,Modeling case studies–Online Ticket Reservation system; Point of sales.

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

CO1. Analyse user requirements and prepare software requirements specifications.

CO2. Apply design principles of UML for software design.

CO3. Apply tools for developing UML diagrams.

CO4. Use cost estimation models for project evaluation.

CO5. Work effectively as an individual to design UML models.

CO6. Write and present a substantial technical report/document effectively.

LIST OF EXPERIMENTS:

1. Identify Functional and Non-Functional Requirements for:
   i) Online Ticket Reservation for Railways ii) Online Auction Sales
2. a) Construct a flow graph for Insertion sort algorithm.
   b) Write a program to find Cyclomatic complexity for the above flow graph
   (**Hint**: McCabe's cyclomatic matrices V(G) of a graph G with n vertices , e edges and P connected components is V(G)=e-n+2P)

CASE STUDIES:

Case studies given below should be Modeled using Visual Modeling tools in different views i.e. Use case view, logical view, component view, Deployment view.

CASE STUDY 1: ONLINE TICKET RESERVATION FOR RAILWAYS

Problem Statement: Computer plays an integral part of the day in today's life. It makes the entire job easier and faster, every job is computerized so as the ticket reservation we can book over the online ticket reservation system. During the booking of the ticket reservation passenger has to select origin, date of journey, destination, class of train etc. The reservation counter keeps track of passenger's information. Thus the system will have all the details about the trains and facilities provided by them. There are various trains with the different level of convenience for the passengers. The whole database will be maintained by database administrator. There are varieties of trains where the passengers can select the train according to the convenience for their destination journey. The journey could be within the state or across the India. Each train has the three types of classes i.e. Sleeper class, First class and the AC compartment. Design the application for the above problem description.

CASE STUDY 2: A POINT OF SALE (POS) SYSTEM

Problem Statement: A POS System is a computerized application used to record sales and handle payments; it is typically used in a retail store. It includes hardware

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components such as a computer and bar code scanner, and software to run the system. It interfaces to various service applications, such as a third-party tax calculator and inventory control. These systems must be relatively fault tolerant; that is, even if remote services and temporarily unavailable they must still be of capturing sales and handling at least cash payments. A POS system must support multiple and varied client – side terminals and interfaces such as browser, PDA's, touch – screens.

CASE STUDY 3: RECRUITMENT PROCEDURE FOR SOFTWARE INDUSTRY

Problem Statement: In the software industry the recruitment procedure is the basic thing that goes in the hand with the requirement as specified by the technical management team. HR first gives an advertisement in leading Newspapers, Journals, Weeklies and Websites. The job seekers can apply for it through by Post or by e-mail to the company. The technical skill and the experience of the candidates are reviewed and the short listed candidates are called for the interview. There may be different rounds for interview like the written test, technical interview, and HR interview. After the successful completion of all rounds of interview, the selected candidates' names are displayed. Meanwhile HR gives all the details about the salary, working hours, terms and conditions and the retirement benefit to the candidate.

CASE STUDY 4: ONLINE AUCTION SALES

Problem Statement: The online auction system is a design about a website where sellers collect and prepare a list of items they want to sell and place it on the website for visualizing. To accomplish this purpose the user has to access the site. Incase it's a new user he has to register. Purchaser's login and select items they want to buy and keep bidding for it. Interacting with the purchasers and sellers through messages does this. There is no need for customer to interact with the sellers because every time the purchasers bid, the details will be updated in the database. The purchaser making the highest bid for an item before the close of the auction is declared as the owner of the item. If the auctioneer or the purchaser doesn't want to bid for the product then there is fixed cutoff price mentioned for every product. He can pay that amount directly and own the product. The purchaser gets a confirmation of his purchase as an acknowledgement from the website. After the transition by going back to the main menu where he can view other items.

CASE STUDY 5: TWO FLOOR ELEVATOR SIMULATOR

Problem Statement: The elevator has the basic function that all elevator systems have, such as moving up and down, open and close doors, and of course, pick up passengers. The elevator is supposed to be used in a building having floors numbered from 1 to MaxFloor, where the first floor is the lobby. There are car call buttons in the car corresponding to each floor. For every floor except for the top floor and the lobby, there are two hall call buttons for the passengers to call for going up and down. There is only one down hall call button at the top floor and one up hall call button in the lobby. When the car stops at a floor, the doors are opened and the car lantern indicating the current direction the car is going is illuminated so that the passengers can get to know the current moving direction of the car. The car moves fast between floors, but it should be able to slow down early enough to stop at a desired floor. When an elevator has no requests, it remains at its current floor with its doors closed.

In order to certificate system safety, emergency brake will be triggered and the car will be forced to stop under any unsafe conditions.

CASE STUDY 6: HOME APPLIANCE CONTROL SYSTEM

Problem Statement: A home appliance control system (HACS) is a system which provides various services to remotely operate on home appliances, such as microwave

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oven, TV, and garage door etc through remote devices such as mobile phone, desktop and palm-top.A home appliance control system (HACS) is a system which is controlled by a remote system such as a mobile phone or a palm-top, and at the same time controls, monitors and coordinates home appliances such as air conditioner, microwave oven, garage doors, TV set, VCR, audio controller, indoor/outdoor lights, water sprinkler, home security system, bath tub controller, etc. In order to activate home appliances and to allow for different ways of cooking, the HACS needs mechanisms for communication between the different devices in the system, and for coordination among the various processes running on such devices. The system administrator of the HACS system has the ability to add a new appliance or delete an existing one. The system administrator has the ability to add a new remote device and configure it with HACS or delete an existing one when it is not used. Also the system administrator can create an account for a new user or delete existing account if it is no longer used.

REFERENCE BOOKS:

1. Grady Booch, James Rum Baugh and Ivar Jacobson, "The Unified Modeling Language User Guide," Second Edition, Pearson Education, 2009.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons and David Fado, "UML 2 Toolkit," WILEY-Dreamtech India Pvt. Ltd., 2003.
3. Rajesh Naik and Swapna Kishore, "Software Requirements and Estimation," Tata McGraw Hill, New Delhi, 2001.

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I B. Tech. – I Semester

(19BT10201) **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

(Common to EEE, ECE, EIE, CSE (AI), CSE (DS) and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of Electrical Systems; AC Machines; Semiconductor Devices and Op-Amps.

COURSE OUTCOMES:

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

CO1. Analyze electrical circuits by applying the conceptual knowledge of circuit elements.

CO2. Demonstrate knowledge on various generation technologies, protection devices, safety procedures and BEE standards.

CO3. Demonstrate knowledge on characteristics and applications of transformers and AC machines.

CO4. Demonstrate knowledge on characteristics and applications of diode, BJT and Op-amps.

DETAILED SYLLABUS:

UNIT-I: Principles of Electrical Systems-I (9 Periods)

Basic electrical sources: DC-Battery, AC sources–Single loop generator; Single phase and three phase supply; Electrical circuit elements (R, L and C), Ohm's law, Kirchhoff's laws, Representation of sinusoidal waveforms, peak and RMS values, phasor representation, reactive power, apparent power, real power, energy and power factor.

UNIT-II: Principles of Electrical Systems-II (9 Periods)

Significance of Power factor and power factor correction, most economical power factor. Typical layout of electrical grid; Typical layout and operation of Hydro, Thermal and Solar Power Plants; Fuse, circuit breaker (MCB, MCCB, RCCB, ELCB), relay (elementary treatment); Inverter and UPS (block diagram approach only). Earthing – importance of earthing, pipe earthing and plate earthing; Safety measures. Energy Efficiency (Star rating) standards by BEE.

UNIT-III: Transformers and AC Machines (9 Periods)

Construction and working of a single phase transformer, EMF Equation; Construction and working of three phase induction motor, torque equation, torque-slip characteristics, applications; construction and working of a resistor start &capacitor start and run single phase induction motor, applications; Construction and working of synchronous machine, applications.

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UNIT-IV: Semiconductor Devices (10 Periods)

PN Junction diode, Characteristics, applications - half wave and full wave rectifier.Zener diode, characteristics, application–Regulator.BJT- operation, configurations, characteristics, applications - switch and amplifier.

UNIT-V: Op-Amps (8 Periods)

Operational Amplifier: Block diagram of Op-Amp, equivalent circuit, Op-Amp AC and DC Characteristics, Inverting and Non-Inverting modes. Applications - Adder, Comparator, Integrator and Differentiator.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. AshfaqHussain*, Fundamentals of Electrical Engineering,* Dhanpatrai& Co. (P) Ltd., *3*rd edition, New Delhi, 2009.
2. R. L. Boylestad and Louis Nashelsky, *Electronics Devices and Circuits*, PHI, 11th edition, 2009.

REFERENCE BOOKS:

1. M.S. Naidu, S. Kamakshaiah, *Introduction to Electrical Engineering ,*Tata McGraw-Hill Education, New Delhi, 2007.
2. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International Pvt. Ltd., 4th edition, 2011.

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I B. Tech. – I Semester

(19BT10231) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

(Common to EEE, ECE, EIE, CSE(AI), CSE(DS) and CSBS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: Physics at intermediate level.

COURSE DESCRIPTION: Practical investigations on Electrical circuits, AC Machines, Semiconductor Devices and Op-Amps.

COURSE OUTCOMES:

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

CO1. Analyze, measure, interpret and validate the practical observations by applying the fundamental knowledge of electrical circuits, machines and electronic devices.

CO2. Design Op-amp based amplifier, voltage summer and integrator circuits for desired specifications.

CO3. Work independently and in teams to solve problems with effective communication.

List of Experiments:

Minimum **Ten** experiments are to be conducted.

1. Measurement of electrical quantities (AC & DC) using Voltmeter, Ammeter and Wattmeter.
2. Verification of Ohm's law and Kirchhoff's laws.
3. Circuit
   (a) with one lamp controlled by one switch and provision of 2-pin or 3-pin socket PVC surface conduit system.
   (b) With two lamps controlled by two switches with PVC surface conduit system.
   (c) for Stair case wiring and Godown wiring.
4. Measurement of Power factor and it's improvement.
5. Load test on 1-Phase Transformer.
6. Brake test on 3-Phase Induction Motor.
7. Brake test on 1- phase induction motor.
8. VI Characteristics of PN and Zener Diodes.
9. Ripple factor and load regulations of rectifier with and without filters.
10. Input and output characteristics of CE configuration.
11. Design of inverting and non-inverting amplifiers using op-amp.
12. Design of voltage summer and integrator using op-amp.
13. Soldering practice.

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REFERENCES BOOKS/ LAB MANUALS:

1. P. S. Dhogal, *Basic Practicals in Electrical Engineering*, Standard Publishers, 2004.
2. YannisTsividis, *A First Lab in Circuits and Electronics*, Wiley, 1st edition., 2001

ADDITIONAL LEARNING RESOURCES:

1. www.vlab.co.in, Virtual Electric Circuits Lab, A initiative of MHRD under NMEICT.
2. www.vlab.co.in, Basic Electronics Lab, A initiative of MHRD under NMEICT.
3. https://nptel.ac.in/courses/117106108/
4. https://ocw.mit.edu/high-school/physics/exam-prep/electric-circuits/
5. https://nptel.ac.in/courses/108105017/
6. https://nptel.ac.in/courses/108108112/
7. https://nptel.ac.in/courses/117107094/

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II B. Tech. - II Semester

(19BT50409) **GREEN TECHNOLOGIES**

(Open Elective-2)

(Common to CE, ME, CSE, CSSE, IT, CSE (AI), CSE (DS) and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Analyze energy efficient communication systems such as Telecommunication systems, ICT, Wireless networks and cellular networks by understanding the principles of green communications.

CO2. Understand the impact of conventional energy sources on environment and realize the significance and principles of green energy sources for sustainability.

CO3. Understand the environmental impacts of IT and approaches for Green IT.

CO4. Analyze concepts of sustainable green construction using appropriate tools and techniques following latest developments and considering safety and environment besides communicating effectively in graphical form.

CO5. Demonstrate the environmental impact of traditional manufacturing and explore the need for green manufacturing process promoting sustainability.

DETAILED SYLLABUS:

UNIT I–PRINCIPLES OF GREEN ENGINEERING AND GREEN COMMUNICATIONS (9 periods)

Principles of Green Engineering: Introduction, Definition of green engineering, Principles of green engineering

Green Communications: Introduction, Origin of Green Communications, Energy Efficiency in Telecommunication systems, Telecommunication system model and energy Efficiency, Energy saving concepts, Quantifying energy efficiency in ICT, Energy efficiency metrics of green wireless networks, Embodied energy of communication devices- Introduction, The extended energy model, Embodied/Operating Energy of a BS in Cellular network- A Case study; Energy efficient standards for wireline communications.

UNIT II–GREEN ENERGY (9 periods)

Introduction, green energy systems - composition, adverse impacts,Green energy and sustainability, the target and solution.Diversification and localization of energy systems, green energy and sustainable development.Energy sources and their availability. Green

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energy sources - solar energy, wind energy, geothermal energy, ocean energy, biomass and biogas.

UNIT III–GREEN IT (9 periods)

Introduction, Awareness to Implementation: Green IT Trends, Green Engineering, Greening by IT: Using RFID for Environmental Sustainability, Smart Grids, Smart Buildings and Homes, Green Supply Chain and Logistics, Enterprise-Wide Environmental Sustainability, A Seven-Step Approach to Creating Green IT Strategy: Balancing the Costs and Benefits of Going Green, Research and Development Directions.

UNIT IV–GREEN CONSTRUCTION (9 periods)

Green Building: Concept, Necessity, Characteristics, Benefits, Requisites for green building construction, Sustainability, Concept of REDUCE, REUSE, RECYCLE, RETHINK, REPLENISH AND REFUSE (6 R's), Sustainable construction focus point – Site selection, Planning, Water, Energy, Material, Indoor air quality, Construction procedures, case studies of residential and commercial green buildings.

Vastu: Concept, History, scientific approach, elements of vastu for selecting a plot.

Indian Green Building Council: Introduction to IGBC green homes, Benefits of IGBC, IGBC green home rating system, Introduction to USGBC, LEED rating system, Procedure to get IGBC certification, GRIHA Rating.

UNIT V – GREEN MANUFACTURING (9 periods)

Green Manufacturing - Introduction, Background and Definition; Impact of traditional manufacturing in environmental ecology, Need for green manufacturing, Motivation and barriers to green manufacturing, Advantages and Limitations of green manufacturing, Green manufacturing strategies,Green manufacturing and sustainability, Green manufacturing through clean energy supply, Green packaging and Supply chain.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. KonstantinosSamdanis, Peter Rost, Andreas Maeder, MichelaMeo, Christos Verikoukis, *Green Communications: Principles, Concepts and Practice*, John Wiley & Sons, 2015.
2. G.D. Rai, *Non-conventional Energy Sources*, KhannaPublishers, Delhi, 5th Edition,2011.
3. San Murugesan, G.R. Gangadharan, *Harnessing Green IT – Principles and Practices*, John Wiley & Sons Ltd., 2008.
4. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, *Green Building Handbook*, Volume 1, E & FN Spon, an imprint of Thomson Science & Professional.
5. J Paulo Davim, *Green Manufacturing: Processes and Systems*, Springer, 2012.
6. David A Dornfeld, *Green Manufacturing: Fundamentals and Applications*, Springer, 2013.

REFERENCE BOOKS:

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1. Soli J. Arceivala, *Green Technologies for a better future,* McGraw Hill Education (India) Pvt. Ltd, 2014.
2. Marty Poniatowski, *Foundation of Green Information Technology, Prentice Hall, 2009.*
3. Athanasios V Alavanidis, ThomaisVlachogianni, *Green Chemistry and Green Engineering*, SynchronaThemata, 2012.

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IV B.Tech. - I Semester

(16BT70412)GREEN TECHNOLOGIES

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: --

COURSE DESCRIPTION:

Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

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

CO1. Deploy conceptual knowledge in green technologies pertaining toengineering practice.
CO2. Analyze various green technologies for engineering practice.
CO3. Provide green solutions to engineering problems.
CO4. Apply various green techniques in the engineering practice.
CO5. Consider health and safety issues while providing green solutions to the society.
CO6. Understand issues related to environment sustainability.
CO7. Apply ethical standards for environmental sustainability in the engineering practice.

DETAILED SYLLABUS:

UNIT-I: PRINCIPLES OF GREEN ENGINEERING AND GREEN COMMUNICATIONS (11 Periods)

Principles of Green Engineering:

Introduction, Definition of green engineering, Principles of green engineering.

Green Communications:

Introduction, Origin of Green Communications, Energy Efficiency in Telecommunication systems, Telecommunication system model and energy Efficiency, Energy saving concepts, Quantifying energy efficiency in ICT, Energy efficiency metrics of green wireless networks, Embodied energy of communication devices- Introduction, The extended energy model, Embodied/Operating Energy of a BS in Cellular network- A Case study; Energy efficient standards for wireline communications.

UNIT-II: GREEN ENERGY (09 Periods)

Introduction, adverse impacts of carbon emission, control of carbon emission– methods, greenhouse gas reduction – methods, Energy sources and their availability, Green energy for sustainable development. Green energy sources – Solar energy, Wind energy, Fuel cells, Biofuels, Wave and Geothermal energy (Principle of generation only).

UNIT-III: GREEN IT (09 Periods)

The importance of Green Information technologies, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social Media, Regulating Green IT- Laws, Standards and Protocols; RoHS, REACh, WEEE, Legislating for

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GHG Emissions and Energy Use of IT Equipment, Non-regulatory Government Initiatives, Industry Associations and Standard Bodies, Green Building Standards, Green Data Centres, Social Movements and Greenpeace, Conclusions.

UNIT-IV: GREEN CONSTRUCTION (09 Periods)

Green Building: Definition, Typical features, Benefits, Requisites for green building construction, Sustainability, Concept of REDUCE, REUSE, RECYCLE, RETHINK, REPLENISH AND REFUSE (6 R's), Sustainable construction focus point – Site selection, Planning, Water, Energy, Material, Indoor air quality, Construction procedures.

Indian Green Building Council: Introduction to IGBC green homes, Benefits of IGBC, IGBC green home rating system, Introduction to USGBC, LEED rating system, Procedure to get IGBC certification, GRIHA Rating.

UNIT-V: GREEN MANUFACTURING (09 Periods)

Introduction, background, definition, motivation and barriers to green manufacturing, Impact of manufacturing in environmental ecology, Need for green manufacturing, Advantages and Limitations, green manufacturing strategies, Green manufacturing and sustainability, Sustainability tools; Waste stream mapping and application, Green manufacturing through clean energy supply, green lean manufacturing, green packaging and supply chain.

Total Periods: 47

TEXT BOOKS:

1. KonstantinosSamdanis, Peter Rost, Andreas Maeder, MichelaMeo, Christos Verikoukis, *Green Communications: Principles, Concepts and Practice,*John Wiley & Sons, 2015.
2. Soli J. Arceivala, *Green Technologies for a better future,* McGraw Hill Education (India) Pvt. Ltd, 2014.
3. San Murugesan, G.R. Gangadharan, *Harnessing Green IT – Principles and Practices,* John Wiley & Sons Ltd., 2008.
4. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, *Green Building Handbook*, *Volume 1*, E & FN Spon, an imprint of Thomson Science & Professional.
5. *IGBC Green Homes Rating System Version 1.0* – A bridged reference guide.
6. J Paulo Davim, Green Manufacturing: Processes and Systems, Springer, 2012.
7. David A Dornfeld, Green Manufacturing: Fundamentals and Applications, Springer, 2013.

REFERENCE BOOKS:

1. Athanasios V Alavanidis, ThomaisVlachogianni, *Green Chemistry and Green Engineering*, SynchronaThemata, 2012.
2. G.D. Rai, *Non-conventional Energy Sources*, Khanna Publishers, Delhi, 5thEdition,2011.
3. Marty Poniatowski, *Foundation of Green Information Technology, Prentice Hall, 2009.*
4. R. K. Gautham, *Green Homes*, BS publications, 2009.

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II B. Tech. – I Semester

(19BT31202) SOFTWARE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Concepts of Software Engineering; Software Process Models; Conventional and Agile Process Models; Software Requirements Engineering Process; System Analysis; Architectural Design; User Interface Design and Re-engineering; Software Testing; Risk and Quality Management.

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

CO1. Understand fundamental concepts of software engineering and analyze process models required to develop a software system.

CO2. Analyze software requirements and model requirements for the given scenario.

CO3. Apply design concepts and metrics for software development.

CO4. Apply testing strategies and techniques for quality software.

CO5. Analyze risks in software development life cycle and apply risk strategies to mitigate risks.

DETAILED SYLLABUS:

UNIT I: SOFTWARE ENGINEERING AND SOFTWARE PROCESS (11 periods)

A Generic view of process: The Nature of Software, Software Engineering- Software Engineering Layers; The Software Process, Software Engineering Practice, Software myths.

Process models: A Generic Process Model, Prescriptive Process Models-The Waterfall Model, Incremental Process Models, Specialized Process Models; The Unified Process, Agile Development-Agility, Agile Process, Extreme Programming (XP), Scrum, Dynamic System Development Method,Agile Modeling (AM), Agile Unified Process (AUP).

UNIT II: REQUIREMENTS ENGINEERING AND MODELING (07 periods)

Requirements Engineering: Functional and non-functional requirements, the software requirements document, Requirements specifications, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management.

Requirements Modeling: Requirements Analysis, Data Modeling Concepts, Flow-Oriented Modeling,Scenario based Modeling, UML Models that supplement the Use Case, Case study on Requirements modeling for Web and MobileApps.

UNIT III: DESIGN ENGINEERING AND METRICS (09 periods)

Design using UML: Design concepts, Software Architecture, Architectural Styles, Class Diagram - Terms and concepts, Use case Diagram - Terms and concepts, Activity Diagrams - Terms and concepts, Interaction diagrams - Terms and concepts, Statemachine Diagram- Terms and concepts, Component Diagram- Terms and concepts, Deployment Diagram- Terms and concepts.

Process and Project Metrics: Metrics in the process and project domains, Software Measurement, Metrics for software quality.

UNIT IV: SOFTWARE TESTING STRATEGIES AND APPLICATIONS (08 periods)

Testing strategies: A strategic approach to software testing, Strategic issues, Test strategies for conventional software, Test strategies for object oriented software, Validation testing, System testing, The art of debugging.

Testing Conventional Applications: Software testing fundamentals, White box testing-Basis path testing, Control structure testing; Black box testing, Object oriented testing methods.

UNIT V: RISK, QUALITY MANAGEMENT AND REENGINEERING (10 periods)

Risk and Quality Management: Reactive and Proactive risk strategies, Software risks, Risk Mitigation Monitoring and Management (RMMM), RMMM plan, Formal Technical Reviews (FTR), Software Quality Assurance (SQA)-Tasks, Goals and Metrics; Software reliability.

Reengineering: Introduction, Business Process Reengineering (BPR), Software Reengineering, Restructuring, Reverse engineering, Forward engineering.

Total Periods: 45

Topics for self-study shall be included in lesson plan.

TEXT BOOKS:

1. Roger S. Pressman, *Software Engineering - A Practitioner's Approach,* McGraw-Hill International Edition, Eigth Edition, 2015.
2. Ian Sommerville, *Software Engineering*, Pearson Education, Ninth Edition, 2011.

REFERENCE BOOKS:

1. Grady Booch, James Rum Baugh and Ivar Jacobson, "The Unified Modeling Language User Guide," Second Edition, Pearson Education, 2009.
2. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers, Third Edition, 2007.
3. ShelyCashman Rosenblatt, *Systems Analysis and Design*, Thomson Publications, Sixth Edition, 2006.

II B.Tech. - II Semester
(16BT41203) SOFTWARE ENGINEERING
(Common to CSE, IT and CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Concepts of Software Engineering; Software Process Models; Conventional and Agile Process Models; Software Requirements Engineering Process; System Analysis; Architectural Design; User Interface Design and Re-engineering; Software Testing; Risk and Quality Management.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on:
- Fundamental concepts of software engineering.
- Process models.
- Software development life cycle.

CO2. Analyze software requirements and process models required to develop a software system.

CO3. Design and develop a quality software product using design engineering principles.

CO4. Develop software product as per user and societal requirements.

CO5. Follow standards for software development and quality management.

CO6. Demonstrate skills in applying risk and quality management principles for effective management of software projects.

DETAILED SYLLABUS:

UNIT I: SOFTWARE ENGINEERING AND SOFTWARE PROCESS **(11 Periods)**

A Generic View of Process: The nature of software, Software engineering- Software engineering layers; The software process, Software engineering practice, Software myths.

Process Models: A Generic process model, Incremental process models, Evolutionary Process models; The unified process, Agile

Development-Agility, Agile process, Scrum, Agile modeling (AM), Agile Unified Process (AUP), The Cleanroom strategy.

UNIT II: REQUIREMENTS ENGINEERING AND MODELING (7 Periods)

Requirements Engineering: Functional and non-functional requirements, The software requirements document, Requirements specifications, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management.

Requirements Modeling: Data modeling concepts, Flow-oriented modeling, Case study on requirements modeling for WebApps.

UNIT III: DESIGN ENGINEERING AND METRICS (8 Periods)

Design Engineering: Design within the context of software engineering, The Design process, Design concepts, Software architecture, Architectural styles, Architectural design.

Process and Project Metrics: Metrics in the process and project domains, Software measurement, Metrics for software quality.

UNIT IV: SOFTWARE TESTING STRATEGIES AND APPLICATIONS (9 Periods)

Testing Strategies: A strategic approach to software testing, Strategic issues, Test strategies for conventional software, Test strategies for object oriented software, Validation testing, System testing, The art of debugging.

Testing Conventional Applications: Software testing fundamentals, Basis path testing, White box and Black box testing, Object oriented testing methods.

UNIT V: RISK, QUALITY MANAGEMENT AND REENGINEERING (10 Periods)

Risk and Quality Management: Reactive and proactive risk strategies, Software risks, Risk Mitigation Monitoring and Management (RMMM), RMMM plan, Software quality factors, Defect amplification Model, Formal Technical Reviews (FTR), Software Quality Assurance (SQA)-Tasks, Goals and metrics;

Software reliability.

Reengineering: Introduction, Business Process Reengineering (BPR), Software reengineering, Restructuring, Reverse engineering, Forward engineering.

Total Periods: 45

TEXT BOOKS:

1. Roger S. Pressman, *Software Engineering-A Practitioner's Approach,* McGraw-Hill International Edition, Seventh Edition, 2010.
2. Ian Sommerville, *Software Engineering,* Pearson Education, Ninth Edition, 2011.

REFERENCE BOOKS:

1. K. K. Aggarwal and Yogesh Singh, *Software Engineering, New Age International Publishers,* Third Edition, 2007.
2. Shely Cashman Rosenblatt, *Systems Analysis and Design, Thomson Publications,* Sixth Edition, 2006.

III B. Tech. – II Semester
(19BT61201) CLOUD COMPUTING
(IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Object Oriented Programming through Java, Computer Networks and Operating Systems.

COURSE DESCRIPTION: Fundamental Cloud Computing and Virtualization; Understanding Cloud Models and Architectures; Understanding Cloud Services, Applications and Capacity Planning; Exploring Platform as a Service (PaaS); Exploring Infrastructure as a Service (IaaS).

COURSE OUTCOMES: *After successful completion of the course, students will be able to*:

CO1. Demonstrate knowledge on basic concepts and terminologies of Cloud Computing and Virtualization.
CO2. Select appropriate Cloud deployment models, Service models and Architectures in Cloud Application development.
CO3. Analyze Cloud services, Applications and Capacity Planning.
CO4. Apply different PaaS application frameworks to construct Cloud applications.
CO5. Develop web applications through Google, Microsoft and Amazon web services as per societal needs.

DETAILED SYLLABUS:

UNIT I–FUNDAMENTAL CLOUD COMPUTING AND VIRTUALIZATION (10 periods)

Cloud Computing: Origin and influences, Basic concepts and terminology, Goals and benefits, Risks and challenges, Roles and boundaries and Cloud characteristics.

Introduction to Virtualization: Characteristics, Taxonomy of virtualization technologies, Pros and cons of virtualization, Virtualization Technologies: Xen**,** VMware and Hyper-V.

UNIT II– UNDERSTANDING CLOUD MODELS AND ARCHITECTURES (8 periods)

Cloud Models: NIST model, Cloud Cube model, Deployment models: Public, Private, Hybrid and Community; Service models: IaaS, PaaS and SaaS.

Understanding Cloud Architecture: Exploring the Cloud Computing Stack: Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications; Connecting to the Cloud: The Jolicloud Netbook OS and Chromium OS - The Browser as an Operating System.

UNIT III – UNDERSTANDING CLOUD SERVICES, APPLICATIONS AND CAPACITY PLANNING (9 periods)

Understanding Cloud Services and Applications Infrastructure as a Service (IaaS): IaaS workloads, Pods, aggregation, and silos; Platform as a Service (PaaS), Software as a

Service (SaaS): SaaS characteristics, Open SaaS and SOA, Salesforce.com and CRM SaaS; Identity as a Service (IDaaS): Identity, Networked identity service classes, Identity system codes of conduct, IDaaS interoperability; Compliance as a Service (CaaS).

Capacity Planning: Defining Baseline and Metrics: Baseline measurements, System metrics, Load Testing, Resource ceilings, Server and instance types; Network Capacity and Scaling.

UNIT IV – EXPLORING PLATFORM AS A SERVICE (PaaS) (10 periods)

PaaS Application Frameworks: Drupal, Eccentex AppBase 3.0, LongJump, Squarespace, WaveMaker and Wolf Frameworks.

Exploring Platform as a Service using Google Web Services: Surveying the Google Application Portfolio, Google Toolkit and Working with the Google App Engine.

Exploring Platform as a Service using Microsoft Cloud Services: Exploring Microsoft Cloud Services, Defining the Windows Azure Platform, Windows Live: Windows Live Essentials, Windows Live Home and Windows Live for Mobile.

UNIT V – EXPLORING INFRASTRUCTURE AS A SERVICE (IaaS) (8 periods)

Understanding Amazon Web Services, Amazon Web Service Components and Services, Working with the Elastic Compute Cloud (EC2): Amazon Machine Images, Pricing models, System images and software, Creating an account and instance on EC2; Working with Amazon Storage Systems: Amazon Simple Storage System (S3), Amazon Elastic Block Store (EBS) and CloudFront; Understanding Amazon Database Services: Amazon SimpleDB, Amazon Relational Database Service (RDS) and Choosing a database for AWS.

Total Periods: 45

Topics for self-study shall be included in lesson plan.

TEXT BOOKS:

1. Barrie Sosinsky, *Cloud Computing Bible,* Wiley India Pvt Ltd, 2011 (Reprint 2017).
2. Thomas Erl and Ricardo Puttini, *Cloud Computing- Concepts, Technology and Architecture,* Pearson, 2014 (Seventh Impression 2017).

REFERENCE BOOKS:

1. Rajkumar Buyya, Christian Vecchiloa and S Thamarai Selvi, *Mastering Cloud Computing*, McGraw Hill Education, 2013 (Reprint 2017).
2. George Reese, *Cloud Application and Architectures*, O'Relly, 2009 (Reprint 2017).

III B.Tech. - II Semester

(16BT61201) **CLOUD COMPUTING**

(Common to IT and CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on "Computer Networks" and "Operating Systems".

COURSE DESCRIPTION: Virtualization, Virtualization Technologies; Cloud Computing Fundamentals, Deployment Models; Cloud Computing Architecture; Cloud Computing Mechanisms; Cloud Security, Cloud Disaster Recovery; Working with Clouds; and Case Studies.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on services, architecture, types of infrastructural models, disaster recovery and virtualization.

CO2. Analyze the issues in cloud computing Data, Network and Host security.

CO3. Apply API development skills in web applications for Cloud deployment.

CO4. Use research based knowledge to build cloud applications.

CO5. Use advanced programming languages to access cloud services.

CO6. Build cloud environment suitable for societal requirements.

DETAILED SYLLABUS:

UNIT I: INTRODUCTION TO VIRTUALIZATION AND TECHNOLOGIES (9 periods)

Introduction to Virtualization: Definition, Objectives, Characteristics, Benefits of virtualization, Taxonomy of virtualization technologies, Pros and cons of virtualization.

Virtualization Technologies: VMware, Hyper-V, Zen and virtual iron.

UNIT II: FUNDAMENTAL CLOUD COMPUTING AND MODELS (9 Periods)

Cloud Computing: Origin and influences, Basic concepts and terminology, Goals and benefits, Risks and challenges.

Cloud Models: Roles and boundaries, Cloud characteristics, Cloud delivery models, Cloud deployment models.

UNIT III: CLOUD COMPUTING MECHANISMS AND ARCHITECTURE (9 Periods)

Cloud-Enabling Technology: Broadband networks and internet architecture, Data center technology, Virtualization technology, Web

technology, Multitenant technology, Service technology.

Cloud Architectures: Architecture - Workload distribution, Resource pooling, Dynamic scalability, Elastic resource capacity, Service load balancing, Cloud bursting, Elastic disk provisioning, Redundant storage.

UNIT IV: CLOUD SECURITY AND DISASTER RECOVERY

(9 Periods)

Cloud Security: Data, Network and host security, Cloud security services and cloud security possible solutions.

Cloud Disaster Recovery: Disaster recovery planning, Disasters in the cloud, Disaster management, Capacity planning and cloud scale.

UNIT V: CLOUD CASE STUDIES (9 Periods)

Case Studies: Software-as-a-Service (SaaS) - Salesforce.com, Facebook; Platform-as-a-Service (PaaS) - Google App Engine, MS-Azure and IBM Bluemix; Infrastructure-as-a- Service (IaaS)
- Amazon EC2, Amazon S3 and Netflix.

Total Periods: 45

TEXT BOOKS:

1. Thomas Erl and RicardoPuttini, *Cloud Computing- Concepts, Technology and Architecture,* Pearson, 2013.
2. Ivanka Menken and Gerard Blokdijk, *Cloud Computing Virtualization Specialist Complete Certification Kit - Study Guide Book,* Lightning Source, 2009.

REFERENCE BOOKS:

1. Barrie Sosinsky, *Cloud Computing Bible,* Wiley India Pvt Ltd, 2011.
2. Rajkumar Buyya, James Broberg and Andrzej Goscinski, *Cloud Computing Principles and Paradigms,* John Wiley and Sons, 2011.
3. John W. Rittinghouse and James F. Ransome, *Cloud Computing Implementation, Management and Security,* CRC Press, Taylor and Francis Group, 2010.

IV B. Tech. – I Semester
(19BT71201) DATA ANALYTICS
(Common to CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Database Management Systems.

COURSE DESCRIPTION: The course provides Introduction to Data Analytics and its Life Cycle, Review of Basic Data Analytic Methods Using R, Advanced Analytical Theory and Methods, Advanced Analytics-Technology and Tools: In-Database Analytics and Communicating and Operationalizing an Analytics Project

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Use Analytical Architecture and its life cycle in Data Analytics
CO2. Analyze and Visualize the Data Analytics Methods using R.
CO3. Apply Advanced Analytical Methods for Text Analysis and Time –Series Analysis.
CO4. Develop Analytical Report for given Analytical problems.
CO5. Analyze and Design Data Analytics Application on Societal Issues.

DETAILED SYLLABUS:

UNIT I – INTRODUCTION TO DATA ANALYTICS and R (9 periods)

Practice in Analytics: BI versus Data Science, Current Analytical Architecture, Emerging Big Data Ecosystem and a New Approach to Analytics. **Data Analytics Life Cycle**: Key Roles for a Successful Analytics Project Background and Overview of Data Analytics Lifecycle Phases - Discovery Phase, Data Preparation Phase, Model Planning, Model Building, Communicate Results, Operationalize. **Introduction to R:** R Graphical User Interfaces, Data Import and Export, Attribute and Data Types, Descriptive Statistics.

UNIT II – BASIC DATA ANALYTICAL METHODS (9 periods)

Exploratory Data Analysis: Visualization Before Analysis, Dirty Data, Visualizing a Single Variable, Examining Multiple Variables, Data Exploration Versus Presentation. **Statistical Methods for Evaluation**: Hypothesis Testing, Difference of Means, Wilcoxon Rank-Sum Test, Type I and Type II Errors, Power and Sample Size, ANOVA, Decision Trees in R, Naïve Bayes in R.

UNIT III – ADVANCED ANALYTICAL TECHNOLOGY AND METHODS (9 periods)

Time Series Analysis: Overview of Time Series Analysis, Box-Jenkins Methodology, ARIMA Model, Autocorrelation Function (ACF),Autoregressive Models, Moving Average Models , ARMA and ARIMA Models ,Building and Evaluating an ARIMA Model, Reasons to Choose and Cautions.

Text Analysis: Text Analysis Steps, A Text Analysis Example, Collecting Raw Text, Representing Text, Term Frequency—Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments, Gaining Insights.

UNIT IV –ANALYTICAL DATA REPORT AND VISULAIZATION (9 periods)

Communicating and Operationalizing an Analytics Project, Creating the Final Deliverables: Developing Core Material for Multiple Audiences, Project Goals, Main Findings, Approach, Model Description, Key Points Supported with Data, Model Details Recommendations, Additional Tips on Final Presentation, Providing Technical Specifications and Code, Data Visualization.

UNIT V –DATA ANALYTICS APPLICATIONS (9 periods)

Text and Web: Data Acquisition, Feature Extraction, Tokenization, Stemming, Conversion to Structured Data, Sentiment Analysis, Web Mining.

Recommender Systems: Feedback, Recommendation Tasks, Recommendation Techniques, Final Remarks.

Social Network Analysis: Representing Social Networks, Basic Properties of Nodes, Basic and Structural Properties of Networks.

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOKS:

1. EMC Education Services, Data Science and Big Data Analytics – Discovering, Analyzing, Visualizing and Presenting Data, John Wiley and Sons, 2015.

2. Joao Moreira, Andre Carvalho, Andre Carlos Ponce de Leon Ferreira Carvalho, Tomas Horvath, *A General Introduction to Data Analytics*, John Wiley and Sons, 1st Edition, 2019·

REFERENCE BOOKS:

1. Anil Maheshwari, *Data Analytics Made Accessible*, Lake Union Publishing, 1st Edition, 2017.
2. Richard Dorsey, Data Analytics: Become a Master in Data Analytics, Create Space Independent Publishing Platform, 2017.

III B. Tech. – I Semester
(19BT51203) ADVANCED DATABASES
(IT)
(Professional Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Database Management Systems and Computer Networks.

COURSE DESCRIPTION: Parallel Databases; Object Based Databases; Distributed Databases; XML; Emerging Database Technologies and Applications.

COURSE OUTCOMES: *After successful completion of the course, students will be able to*:

CO1. Design parallel databases for efficient data access.
CO2. Apply object oriented concepts to design object based databases.
CO3. Design distributed databases by analyzing various data fragmentations.
CO4. Create XML databases for web based applications.
CO5. Demonstrate knowledge on emerging database technologies: mobile, multimedia and NoSQL databases.

DETAILED SYLLABUS:

UNIT-I: PARALLEL DATABASES (09 periods)

Introduction, I/O Parallelism, Inter query Parallelism, Intra query Parallelism, Intra operation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems, Parallelism on Multicore Processors.

UNIT-II: OBJECT-BASED DATABASES (09 periods)

Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multi set Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R Features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational.

UNIT-III: DISTRIBUTED DATABASES (09 periods)

Features of Distributed versus Centralized Databases, Reference Architecture for Distributed Databases, Types of Data Fragmentation, Integrity Constraints in Distributed databases, Distributed Database Design

UNIT-IV: XML (09 periods)

Structure of XML data, XML Document Schema, Querying and Transformation, Application Program Interfaces to XML, Storage of XML Data, XML Applications

UNIT-V: EMERGING DATABASE TECHNOLOGIES AND APPLICATION (09 periods)

Mobile Database, Geographic Information Systems, Genome Data Management, Multimedia Database; NoSQL-An Overview of NoSQL, Characteristics of NoSQL, NoSQL Storage Types

Total Periods: 45

Topics for self-study shall be included in lesson plan.

TEXT BOOKS:

1. A. Silberschatz, H. F. Korth and S. Sudarshan, *Database System Concepts*, Tata McGraw hill , 7th Edition, 2019.
2. Stefand Ceri and Giuseppe Pelagatti, *Distributed Databases Principles and Systems*, McGraw hill, 1st Edition, 2008.

REFERENCE BOOKS:

1. Ramea Elmasri and Shamkant B.Navathe, *Fundamentals of database Systems*, Pearson Education, 5th Edition, 2007.
2. Gaurav Vaish, *Getting Started with NoSQL*, Packt Publishing, 1st Edition, 2013. (e-book)

III B.Tech. - II Semester

(16BT61203) **ADVANCED DATABASES**

(Program Elective - 1)

Int. Marks	Ext. Marks	Total Marks				L	T	P	C	30	70
	100		3			1	-	3			

PRE-REQUISITES: Courses on "Database Management Systems" and "Computer Networks".

COURSE DESCRIPTION: Parallel Databases; Object based Databases; Distributed Databases; Distributed Transaction Management; Emerging Database Technologies and Applications.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on:

- Parallel databases.
- Object based and Object Relational databases.
- Distributed databases, horizontal and vertical data fragmentations.
- Mobile databases, Geographic Information Systems, Genome Data Management, Multimedia Database and NoSQL.

CO2. Demonstrate skills in Query optimization, Data Fragmentation, Transaction Management and Con- currency Control for Distributed Transactions.

CO3. Design Parallel, Object-Oriented, Object-Relational and NoSQL databases.

CO4. Solve Concurrency Problems in Distributed Transactions. CO5. Use database techniques for Mobile, Geographic Information Systems, Genome Data Management, and Multimedia Data.

CO6. Create databases as per societal needs.

DETAILED SYLLABUS:

UNIT-I: PARALLEL DATABASES (9 Periods)

Introduction, I/O Parallelism, Inter query parallelism, Intra query parallelism, Intra operation parallelism, Interoperation parallelism,

Query optimization, Design of parallel systems, Parallelism on multi-core processors.

UNIT-II: OBJECT-BASED DATABASES (9 Periods)

Overview, Complex data types, Structured types and inheritance in SQL, Table inheritance, Array and multi set types in SQL, Object-identity and reference types in SQL, Implementing O-R features, Persistent programming languages, Object-Relational mapping, Object-Oriented

versus Object-Relational.

UNIT-III: DISTRIBUTED DATABASES (9 Periods)

Features of distributed versus centralized databases, Reference architecture for distributed databases, Types of data fragmentation, Integrity constraints in distributed databases, Distributed database design.

UNIT-IV: DISTRIBUTED TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL (9 Periods)

Distributed Transaction Management: Framework for transaction management, Supporting atomicity of distributed transactions, Concurrency control for distributed transactions, Architectural aspects of distributed transactions; Concurrency Control: Foundation of distributed concurrency control, Distributed deadlocks, Concurrency control Based on timestamps.

UNIT-V: EMERGING DATABASE TECHNOLOGIES AND APPLICATION (9 Periods)

Mobile database, Geographic information systems, Genome data management, Multimedia database; NoSQL-An overview of NoSQL, Characteristics of NoSQL, NoSQL storage types.

Total Periods: 45

TEXT BOOKS:

1. A. Silberschatz, H. F. Korth and S. Sudarshan, *Database System Concepts,* Tata McGraw hill, Sixth Edition, 2010.
2. Stefand Ceri and Giuseppe Pelagatti, *Distributed Databases Principles and Systems,* McGraw hill, 2008.

REFERENCE BOOKS:

1. Ramea Elmasri and Shamkant B.Navathe, *Fundamentals of Database Systems,* Pearson Education, Fifth Edition, 2007.
2. Gaurav Vaish, *Getting Started with NoSQL,* Packt Publishing, 2013 (e-book).

IV B. Tech. – I Semester

(19BT71205) DECISION SUPPORT AND INTELLIGENT SYSTEMS

(IT)

(Professional Elective-4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Database management Systems, Data Warehousing and Data Mining.

COURSE DESCRIPTION: Decision Support Systems Development, Collaborative Computing Technologies, Enterprise Information Systems, Knowledge Acquisition, Representation & Reasoning, Advanced intelligence system, Implementing MSS in the E-Business ERA and Integration, Impacts and the future of management support systems.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on phases of management support and decision making systems.

CO2. Develop efficient decision support systems by choosing appropriate decision models.

CO3. Demonstrate knowledge on collaborative computing technologies, enterprise information systems and knowledge management for making Decision Support Systems.

CO4. Apply Artificial Intelligence, Machine Learning and Genetics Algorithms for decision making.

CO5. Demonstrate knowledge on Management Support Systems in E-Business, E-Commerce, L-Commerce, Intra-business, Legal and Ethical Issues in E-commerce.

DETAILED SYLLABUS:

UNIT I– DECISION MAKING AND COMPUTERIZED SUPPORT (9 periods)

Management support systems: Managers and Decision-Making ,Managerial Decision-Making and Information Systems ,Managers and Computer Support, Computerized Decision Support and the Supporting Technologies, A Framework for Decision Support , The Concept of Decision Support Systems, Group Support Systems, Enterprise Information System, Knowledge Management Systems, Expert Systems, Artificial Neural Networks, Advanced Intelligent Decision Support Systems, Hybrid Support Systems . **Decision making systems modeling- support**: Phases of decision Making Process.

UNIT II – DECISION SUPPORT SYSTEMS (9 periods)

Decision Support Systems: DSS Configurations, What Is a DSS, Characteristics and Capabilities of DSS, Components of DSS, The User, DSS Hardware, DSS Classifications. **Modeling and Analysis**: MSS Modeling, Static and Dynamic Models, Certainty, Uncertainty,

and Risk. Decision Analysis of a Few Alternatives (Decision Tables and Decision Trees), The Structure of MSS Mathematical Models.

Decision Support System Development: The Traditional System Development Life Cycle, Alternative Development Methodologies.

UNIT III– COLLABORATIVE COMPUTING TECHNOLOGIES (9 periods)

Collaborative Computing Technologies: Group Support Systems, Group Decision-Making, Communication and Collaboration, Communication Support, Group Support Systems, Group Support Systems Technologies, Group systems Meetingroom and Online, The GSS Meeting Process.

Enterprise Information Systems: Concepts and Definitions, The Evolution of Executive and Enterprise Information Systems, Excecutive Roles and Information Needs**. Knowledge Management**: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Initiatives, Approaches to Knowledge.

UNIT IV – INTELLIGENT DECISION SUPPORT SYSTEMS (9 periods)

Artificial Intelligence and Expert Systems: Concepts and Definitions of Artificial Intelligence, Evolution of Artificial Intelligence, The Artificial Intelligence Field, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems.

Knowledge Acquisition, Representation & Reasoning: Methods of Knowledge Acquisition from Experts, Knowledge Verification and Validation, Representation of Knowledge, Reasoning in Rule-Based Systems.

Advanced intelligence system: Machine-Learning Techniques, Case-Based Reasoning, and Genetic Algorithms Fundamentals.

UNIT V – IMPLEMENTING MSS IN THE E-BUSINESS ERA (9 periods)

Implementing MSS in the E-Business ERA: E-Commerce Mechanisms: Auctions and Portals, Business-to-Consumer Applications, Market Research, e-CRM, and Online Advertising, Intrabusiness, Business-to-Employees, and People-to-People, E-Government, E-Learning, and Customer-to-Customer EC, M-Commerce, L-Commerce, and Pervasive Computing, Legal and Ethical Issues in E-Commerce.

Integration, Impacts and the future of management support systems: Models of MSS Integration Intelligent Modeling and Model Management, MSS Impacts on Organizations, Intelligent Systems and Employment Levels, Internet Communities, The Future of Management-Support Systems

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOK:

1. Efraim Turban, Jay E Aronson and Ting-Peng Liang, *Decision Support Systems and Intelligent Systems*, Prentice Hall India, 7th Edition, 2007.

REFERENCE BOOKS:

1. V. S. Janakiraman and K. Sarukesi, *Decision Support Systems*, PHI Learning, 1st Edition, 2009.
2. Efrem G Mallach, *Decision Support Systems and Data Warehouse Systems*, McGraw Hill, 2008.

III B. Tech. – I Semester

(19BT61041) SENSORS AND APPLICATIONS

(Inter Disciplinary Elective)
(CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:-

COURSE DESCRIPTION: Sensor based measurement system, Resistive and Electromagnetic Sensors, Flow, Pressure and Level Transducers, Self-Generating Temperature sensors, Digital and semiconductor sensors

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on basics of various resistive sensors.

CO2. Analyze various transducers used for Flow, Pressure and level measurement.

CO3. Understand various Self-generating sensors.

CO4. Demonstrate knowledge on various digital and semiconductor sensors.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO SENSOR- BASED MEASUREMENT SYSTEMS **(8 Periods)**

General Concepts And Terminology, Sensor Classification, General Input-Output Configuration, Static Characteristics Of Measurement Systems, Dynamic Characteristics, Other Sensor Characteristics, Primary Sensors, Materials For Sensors, Micro sensor Technology.

UNIT-II: RESISTIVE SENSORS **(8 Periods)**

Principle of transducers, classification, Factors influencing the choice of transducers. Potentiometers, Metal and semiconductor strain gauges-principle of operation, gauge factor, gauge sensitivity; Resistance temperature detectors, Thermistors, Light dependent resistors, resistive hygrometer.

UNIT–III: FLOW, PRESSURE AND LEVEL TRANSDUCERS **(10 Periods)**

Flow Transducers Like Differential Pressure, Positive Displacement, Ultrasonic Flow meter, Turbine Flow meter, Vortex Flow meter, Electromagnetic Flow meter, Coriolis Effect Flow meter, Pressure Transducers Like Mercury Pressure Sensor, Bellows, Membranes And Thin Plates, Piezo-resistive Sensors, Optoelectronic Sensors, Vacuum Sensors, Level Transducers Like Displacer, Float, Pressure Gages, Balance Method, Level Measurements By Detecting Physical Properties, Applications of various flow, Pressure and Level transducers.

UNIT–IV: SELF-GENERATING SENSORS **(10 Periods)**

Thermo electric sensors: Thermo electric effects, Thermo couple laws, Cold junction compensation, common thermo couples. Piezo electric sensors- Piezoelectric effect, deformation modes, equivalent circuit, materials; Pyro electric Sensors- Pyroelectric effect, materials; photoelectric sensors- photovoltaic effect, materials; Magneto- strictive sensors.

UNIT-V: DIGITAL AND SEMICONDUCTOR SENSORS **(9 Periods)**

Digital transducers: Tachometer encoder, incremental encoder, absolute encoder. Semiconductor sensors- principle of operation and techniques; Film sensors- Thin film sensors, Thick film sensors; Fiber optic sensors-principle of operation, sensor technology; Ultrasonic sensors-principle of operation, sensing methods; Basics of SMART sensors.

Total Periods: 45

Topics for self- study are provided in the lesson plan

TEXTBOOKS:

1. D. Patranabis, *Principles of Industrial Instrumentation*, TMH, 3rd Edition, 2010.
2. Ramon Pallás Areny, John G. Webster, *Sensors and Signal Conditioning*, John Wiley and Sons, 2nd Edition, 2000.
3. Webster John G., "*Instrumentation and Sensors Hand book*", CRC Press, 1st Ed., 1999.

REFERENCEBOOKS:

1. Jacob Fraden, "Hand book of Modern Sensors: Physics, Designs and Applications", Springer, 3rd Ed., 2004.
2. A.K.Sawhney, *A Course in Electrical and Electronics Measurements and Instrumentation*, Dhanpat Rai and Sons, 19th edition, 2011.

ADDITIONALLEARNINGRESOURCES:

1. https://nptel.ac.in/courses/108105064/
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/108105064/lec1.pdf
3. https://www.ibiblio.org/kuphaldt/socratic/sinst/book/liii.pdf

III B. Tech. - I Semester
(19BT51501) MODERN CRYPTOGRAPHY
(Professional Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A Course on "Computer Networks"

COURSE DESCRIPTION: Cryptographic protocols; Encryption techniques for confidentiality; Mathematics of symmetric and asymmetric algorithms; Hash functions for integrity; digital signature schemes.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply cryptographic protocols to ensure authentication in network systems.
CO2. Analyze the efficiency of cryptographic techniques based on security attacks.
CO3. Select suitable key management scheme for efficient key exchange between the authenticated parties.
CO4. Develop algorithms using information, complexity, and number theories for ensuring the security requirements-CIA.
CO5. Evaluate Message Digest and Secure Hash Algorithms using hash functions for data Integrity.
CO6. Analyze the performance of digital signature algorithms for securing communication.

DETAILED SYLLABUS:

UNIT I – FOUNDATIONS OF CRYPTOGRAPHY (8 Periods)

FOUNDATIONS OF CRYPTOGRAPHY: Steganography, Substitution ciphers and Transposition Ciphers, One Time Pads. **Protocol Building Blocks:** Introduction to protocols, communications using symmetric Cryptography, One-Way Hash Functions, Communications Using Public-Key Cryptography, Digital Signatures with Encryption, Random and Pseudo-Random-Sequence Generation, **Basic Protocols**: Key Exchange, Authentication and key Exchange.

UNIT II-CRYPTOGRAPHIC TECHNIQUES (8 Periods)

CRYPTOGRAPHIC TECHNIQUES: Key Management, Electronic Codebook Mode, Block Replay, Cipher Block Chaining Mode, Stream Ciphers, Self-Synchronizing Stream Ciphers, Cipher-Feedback Mode, Synchronous Stream Ciphers, Output-Feedback Mode, Counter Mode, Choosing a Cipher Mode, Interleaving, Block Ciphers versus Stream Ciphers.

UNIT III-MATHEMATICS FOR CRYPTOGRAPHIC ALGORITHMS (12 Periods)

MATHEMATICS FOR CRYPTOGRAPHIC ALGORITHMS: Mathematical background: Information Theory, Complexity Theory, Number Theory, Factoring, Prime Number Generation, Discrete Logarithms in a Finite Field, Data **Encryption S**tandard (DES), DES decryption, Security of DES, DES variants, Public Key Algorithms: RSA, Pholig-Hellman, RABIN, Elliptic Curve Cryptosystems.

UNIT IV-HASH FUNCTIONS (8 Periods)

HASH FUNCTIONS: One Way Hash Functions, Snefru hash function, N- Hash, MD4, MD5, Secure Hash Algorithm (SHA), Security of SHA, One Way Hash Functions Using Symmetric Block Algorithms, Using Public-Key Algorithms, Message Authentication Codes (MAC).

UNIT V-DIGITAL SIGNATURES **(9 Periods)**

DIGITAL SIGNATURES: Digital Signature Algorithm (DSA),Security of DSA, Discrete Logarithm Signature Schemes, Ongchnorr-Shamir, SCHNORR authentication and signature scheme, Diffie-Hellman Key exchange, Station-to-Station Protocol, Shamir's Three-Pass Protocol.

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXTBOOKS:

1.Bruce Schneier, "*Applied Cryptography: Protocols, Algorithms and Source Code in C*", 7th Edition, John Wiley and Sons, New York, 2009.

REFERENCE BOOKS:

1. Alfred J Menezes, Paul C van Oorschot and Scott A.Vanstone, "*Handbook of Applied Cryptography*", CRC Press, New York, 2010.
2. Wenbo Mao, "*Modern Cryptography Theory and Practice*", Pearson Education, 2004

ADDITIONAL LEARNING RESOURCES:

https://www.coursera.org/specializations/applied-crypto
https://www.udacity.com/course/applied-cryptography--cs387
https://www.classcentral.com/course/udacity-applied-cryptography-326
https://www.classcentral.com/course/udacity-applied-cryptography-326
https://wiki.openssl.org/index.php/Command_Line_Utilities
https://www.sslshopper.com/article-most-common-openssl-commands.html

III B. Tech. – I Semester

(19BT51502) NATURAL LANGUAGE PROCESSING

(Professional Elective-1)
(Common to CSSE, CSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:
A course on "Theory of Computation"

COURSE DESCRIPTION:
Language Modeling, Regular Expressions, Text Normalization, Word level analysis, PoS Tagging and Entropy models; Context free grammars and Parsing techniques; Semantics and pragmatics, Discourse analysis and lexical resources.

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

CO1: Demonstrate knowledge on Regular Expressions, Words, Corpora and Tokenization in Natural Language Processing.
CO2: Analyze various models and techniques for world level recognition
CO3: Construct Grammars to implement Parsing for text Processing
CO4: Analyze Word level similarities using Semantics and Pragmatics
CO5: Analyze different algorithms on Discourse Analysis for Natural Language Processing applications
CO6: Investigate Probabilistic models to perform syntax analysis in Natural Language Processing

DETAILED SYLLABUS:

UNIT I– INTRODUCTION **(9 periods)**

Origins and challenges of NLP, Language Modeling- Grammar based LM, Statistical LM, Regular Expressions, Words, Corpora, Text Normalization – Tokenization and Normalization, Word Tokenization, Byte-Pair Encoding for Tokenization, Word Normalization, Lemmatization and Stemming, Minimum Edit Distance.

UNIT II –WORD LEVEL ANALYSIS **(9 periods)**

N-grams, Evaluating Language models, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing, Backoff, Naive Bayes Classifiers, Training Naive Bayes Classifier, Worked example, Sentiment analysis, Test sets and cross validations, English Word classes, Part of Speech Tagging, HMM Part-of-speech Tagging, Conditional Random Field(CRFs),Evaluation of Named Entity Recognition.

UNIT III –SYNTACTIC ANALYSIS **(9 periods)**

Context-Free Grammars, Grammar rules for English, Treebanks, Grammar equivalence and Normal Forms, Lexicalized grammars, Ambiguity, CYK Parsing- Dynamic Programming Approach, Span-Based Neural Constituency Parsing, Evaluating Parsers, Partial parsing, CCG Parsing, Dependency Parsing- Dependency Relations, Dependency Formalisms, Dependency Treebanks, Transition-Based Dependency Parsing, Graph-Based Dependency Parsing.

UNIT IV – SEMANTICS AND SEMANTICS PARSING **(9 periods)**

Information Extraction- Relation Extraction, Relation Extraction Algorithms, Extracting Times, Template Filling, Word Senses, Relations between Senses, WordNet, Word Sense Disambiguation, Alternate WSD algorithms and Tasks, Using Thesauruses to improve Embeddings, Semantic Roles, The Proposition Bank, Frame Net, Semantic Role Labeling, Primitive Decomposition of Predicates.

UNIT V – DISCOURSE ANALYSIS AND LEXICAL RESOURCES (9 periods)

Coreference Phenomena: Linguistic Background , Coreference Tasks and Datasets , Mention Detection, Architectures for Coreference Algorithms , Classifiers using hand-built features , A neural mention-ranking algorithm ,Evaluation of Coreference Resolution, Discourse Coherence, Coherence Relations ,Discourse Structure Parsing Centering and Entity-Based Coherence , Representation learning models for local coherence, Global Coherence .

Case study: Question Answering and Summarization, Dialogue and Conversational Agents.

Total Periods: *45*

Topics for self-study are provided in lesson plan.

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin—*"Speech and Language Processing: An Introduction to Natural Language Processing"*, Computational Linguistics and Speech, Pearson Publication, 2020.

REFERENCE BOOKS:

1. Breck Baldwin, —*"Language processing with Java and LingPipe Cookbook "*Atlantic Publisher, 2015.
2. Richard M Reese, —*"Natural Language Processing with Java"*, OReilly Media, 2015
3.Steven Bird, Ewan Klein and Edward Loper, —*"Natural Language Processing with Python"*,
1st Edition, OReilly Media, 2009.

ADDITIONAL LEARNING RESOURCES:

https://nptel.ac.in/courses/106/105/106105158/

III B. Tech. – I Semester

(19BT51503) PARALLEL COMPUTER ARCHITECTURES

(Professional Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:-A Course on "Computer Organization"

COURSE DESCRIPTION: Quantitative Principles of Computer Design, Memory Heirarchy Optimizations of Cache Performance, Virtual Memory and Virtual Machines, Data Hazards with Dynamic Scheduling, Thread Level Parallelism, Vector Architecture, Loop Level Parallelism, Multi core Processors, Programming Models and Workloads for Warehouse Scale Computers.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on basic fundamentals of Computer Architecture Design, Warehouse scale computers

CO2. Analyze the performance of cache and virtual memory architectures using optimization techniques.

CO3. Select suitable technique among branch prediction and dynamic scheduling to improve the functionality of instruction level.

CO4. Analyze the performance of Uniprocessor system using multi-threading.

CO5. Apply data level parallelism on vector, SIMD and GPU architectures to detect and increase the efficiency of loop level parallelism.

CO6. Analyze the performance of shared memories, synchronization models by implementing thread level parallelism.

DETAILED SYLLABUS:

UNIT I: FUNDAMENTALS OF QUANTITATIVE DESIGN AND ANALYSIS **(10 periods)**

INTRODUCTION: Classes of Computers, Defining Computer Architecture, Trends in Technology, Trends in Power and Energy in Integrated Circuits, Trends in Cost, Dependability, Measuring, Reporting, and Summarizing Performance, Quantitative Principles of Computer Design.

UNIT II: MEMORY HIERARCHY DESIGN **(8 periods)**

OPTIMIZATIONS OF CACHE PERFORMANCE: Ten Advanced Optimizations of Cache Performance, Memory Technology and Optimizations.

PROTECTION: Virtual Memory and Virtual Machines.

UNIT III: INSTRUCTION LEVEL PARALLELISM AND ITS EXPLOITATION **(9 periods)**

ILP: Concepts and Challenges, Reducing Branch Costs with Advanced Branch Prediction, Overcoming Data Hazards with Dynamic Scheduling.

DYNAMIC SCHEDULING: Hardware Based Speculation, Studies of the Limitations of ILP.

MULTITHREADING: Exploiting Thread Level Parallelism to Improve Uniprocessor Throughput.

UNIT IV: DATA LEVEL PARALLELISM **(8 periods)**

VECTOR, SIMD, AND GPU ARCHITECTURES: Vector Architecture, SIMD Instruction Set Extensions for Multimedia, Graphics Processing Units, Detecting and Enhancing Loop Level Parallelism.

UNIT V: THREAD LEVEL PARALLELISM **(10 periods)**

SHARED MEMORY: Centralized Shared Memory Architectures, Performance of Symmetric Shared Memory Multiprocessors, Distributed Shared Memory and Directory Based Coherence.

SYNCHRONIZATON: Models of Memory Consistency, Multi core Processors and Their Performance.

WAREHOUSE SCALE COMPUTERS: Computer Architecture of Warehouse Scale Computers, Physical Infrastructure and Costs of Warehouse Scale Computers.

Total Periods: 45

Topics for self-study are provided in lesson plan.

TEXT BOOKS:

1. John L. Hennessy and David A. Patterson, "*Computer Architecture: A Quantitative Approach"*, 5th Edition, The Morgan Kaufmann, 2012.

REFERENCE BOOKS:

1. David A Patterson, John L. Hennessy, "*Computer Organisation and Design: Hardware/Software Interface"*, Morgan Kaufman Publishers, 2014.
2. David E. Culler and Jaswinder Pal Singh, with Anoop Gupta. "*Parallel Computer Architecture: A Hardware/Software Approach*". Morgan Kaufmann, 1998.

IIIB. Tech. – I Semester

(19BT51504) PERFORMANCE EVALUATION OF COMPUTER SYSTEMS

(Professional Elective –1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A courses on Numerical Methods, Probability and Statistics.

COURSE DESCRIPTION: Systematic approach of Performance Evaluation; Workload characterization; Hardware and software monitors; Experimental Design and Analysis.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on performance requirements, performance metrics selection and usage for system performance evaluation.
CO2. Analyze characterization techniques for work load selection.
CO3. Analyze various monitors to observe the activities on a system for system performance.
CO4. Demonstrate knowledge on experimental designs to conduct performance analysis
CO5. Design Factorial Experimental models for evaluating the performance of a computer system.
CO6. Apply contextual knowledge to find experimental errors in Factorial designs.

DETAILED SYLLABUS:

UNIT I: INTRODUCTION TO PERFORMANCE EVALUATION (08 Periods)

The art of performance evaluation, Common mistakes, Systematic approach, selecting an evaluation technique, Performance metrics- selection, Usage, Classification, Setting performance requirements.

UNIT II: WORKLOADS (10 Periods)

Types of workloads: Addition Instruction, Instruction Mixes, Kernels, Synthetic Programs, Application Benchmarks, Popular Benchmarks.
Workload selection and Characterization Techniques: Services Exercised, Level of Detail, Representativeness, Timeliness, Terminology, Averaging, Specifying Dispersion, Single-Parameter Histograms, Multi parameter Histograms, Principal-Component Analysis, Markov Models, Clustering.

UNIT III: MONITORS (09 Periods)

Monitor terminology, classification, Software, Hardware monitors, Software versus Hardware monitors, Firmware and Hybrid monitors, and Distributed system monitors, Program execution monitors, Techniques for improving program performance, accounting logs, Analysis and inter presentation of accounting log data.

UNIT IV: EXPERIMENTAL DESIGN AND ANALYSIS (09 Periods)

Experimental design: Terminology, Common mistakes in Experimentation, Types of Experimental Designs, 2^2 Factorial Designs, Computation of effects, Sign table method for calculating effects, Allocation of variation.
General 2^kFactorial Designs: 2^kFactorial Designs, Computation of effects, Estimation of Experimental errors, Allocation of variation, Confidence intervals for effects, Confidence intervals for predicted responses, General 2^kr Factorial design

UNIT V: Full factorial Design (09 Periods)

One factor experiments, Two-factor full factorial Design with out and with replications: Model, Computation of effects, Errors, Allocation of Variation, Analysis of variance, Confidence Intervals for Effects.

147

Total Periods: 45

Topics for self-study are provided in lesson plan.

TEXT BOOK:

1. Raj Jain, *"The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling"*, Wiley-India, Reprint Edition 2014.

REFERENCE BOOKS:

1. Kishore S.Trivedi, *Probability & Statistics with reliability, queuing, and computer science applications*, PHI, 8th Edition, 2011
2. MorHarchol-Balter, *Performance Modeling and Design of Computer Systems*, Cambridge, (2013)

ADDITIONALLEARNING RESOURCES:

1. https://nptel.ac.in/courses/106/106/106106048/
2. https://www.cse.iitb.ac.in/~varsha/cs681/cs681NewLectureNotes.pdf

IV B. Tech. - I Semester

(16BT71504) PERFORMANCE EVALUATION OF COMPUTER SYSTEMS

(Program Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Probability Distributions and Statistical Methods.

COURSE DESCRIPTION: Performance Evaluation Systems; Workload characterization; Hardware and software monitors; Summarization of data, Linear regression models; Experimental Design.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on Performance Metrics, workload selection and Monitors.
CO2. Analyze and interpret the data using summarization techniques.
CO3. Design and develop Factorial Experimental models for evaluating the performance of a computer based systems.
CO4. Use statistical methods for interpretation of data in simulation based systems.
CO5. Select appropriate techniques for prediction of variability and index of dispersion.
CO6. Apply contextual knowledge to asses experimental errors in Factorial designs.

DETAILED SYLLABUS:

UNIT I: INTRODUCTION TO PERFORMANCE EVALUATION (09 Periods)

The art of performance evaluation, Performance projects, Common mistakes, Systematic approach, Selecting an evaluation technique, Performance metrics- selection, Usage, Classification, Setting performance requirements.

UNIT II: WORKLOADS (09 Periods)

Types of workloads: Addition Instruction, Instruction Mixes, Kernels, Synthetic Programs, Application Benchmarks, Popular Benchmarks.

Workload selection and Characterization Techniques: Services Exercised, Level Of Detail, Representativeness, Timeliness, Terminology, Averaging, Specifying Dispersion, Single-Parameter Histograms, Multi parameter Histograms, Principal-Component Analysis, Markov Models, Clustering.

UNIT III: MONITORS (08 Periods)

Monitor terminology, classification, Software, Hardware monitors, Software versus Hardware monitors, Firmware and Hybrid monitors, Distributed system monitors, Program execution monitors, Techniques for improving program performance, Accounting logs, Analysis and inter presentation of accounting log data.

UNIT IV: SUMMARIZING DATA AND LINEAR REGRESSION MODELS (09 Periods)

Summarizing Data: Probability and statistics concepts, Summarizing data by a single number, Selecting among the mean, Median, and Mode, Common misuses of means, Geometric, mean, Harmonic mean, Mean of a ratio, Summarizing variability, Selecting the index of dispersion, Determining distribution of data.

Linear Regression Models: Definition of a good model, Estimation of model parameters, Confidence intervals for regression parameters, Confidence intervals for predictions.

UNIT V: EXPERIMENTAL DESIGN AND ANALYSIS (10 Periods)

Experimental design: Terminology, Common mistakes in Experimentation, Types of Experimental Designs, 2^2 Factorial Designs, Computation of effects, Sign table method for calculating effects, Allocation of variation.

General 2^k Factorial Designs: 2^2r Factorial Designs, Computation of effects, Estimation of Experimental errors, Allocation of variation, Confidence intervals for effects, Confidence intervals for predicted responses, General 2^kr Factorial design

Total Periods: 45

TEXT BOOK:

1. Raj Jain, *The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling*, Wiley-India, Reprint Edition 2014.

REFERENCE BOOKS:

1. Kishore S.Trivedi, *Probability & Statistics with reliability, queuing, and computer science applications*, PHI, 8th Edition, 2011.
2. Paul J. Fortier and Howard E. Michel, *Computer Systems Performance Evaluation and Prediction*, Elsevier, 2003.

III B. Tech. – I Semester

(19BT51505) SOFTWARE TESTING

(Common to CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A course on "Software Engineering"

COURSE DESCRIPTION:
Evolution of Software Testing; Software Testing Life Cycle; Verification and Validation; White Box Testing, Black Box Testing and Regression Testing; Testing Process; Test Management, Software Metrics; Automation Testing and Testing Tools.

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

CO1. Analyze the functionality of software by using software testing methodologies.
CO2. Analyze end user requirements by applying functional testing techniques**.**
CO3. Design test cases to verify the functionality of the software by using test management techniques**.**
CO4. Evaluate the performance of software using Testing Metrics.
CO5. Analyze test metrics and testing tools to measure the quality of software in real time applications.
CO6. Understand the concepts of static and dynamic testing tools for test design and development.

DETAILED SYLLABUS:

UNIT I: INTRODUCTION TO SOFTWARE TESTING (9 periods)

Introduction, Evolution of Software Testing, Myths and Facts, Goals and Psychology of Testing, Definitions, Model for Software Testing, Effective vs Exhaustive Testing, Testing as a Process, Terminology, Software Testing Life Cycle, Software Testing Methodology, Static vs Dynamic Testing.

VERIFICATION AND VALIDATION: Verification and Validation Activities, Verification of High-Level Design and Low-Level Design.

UNIT II: WHITE BOX TESTING and BLACK BOX TESTING (9 periods)

Introduction to Testing Techniques, Need of White-Box Testing, Logic Coverage Criteria, Basis Path Testing, Graph Matrices, Loop Testing, Mutation Testing.

BLACK BOX TESTING: Introduction, Boundary Value Analysis (BVA), Equivalence Class Testing, State Table-Based Testing, Decision Table-Based Testing, Error Guessing.

UNIT III: TESTING PROCESS (10Periods)

Test planning –test policy, contents, strategy, test plan, Quality plan, test plan template, guidelines, test administration and estimation, standards, building test data, test cases, scenarios, templates for test cases, test scripts, effective test cases, building test data, generation of test data, test process monitoring.

UNIT IV: REGRESSION TESTING AND TEST METRICS (8 periods)

REGRESSION TESTING: Introduction, Progressive vs. Regressive Testing, Regression Testing Produces Quality Software, Regression Testability, Objectives of Regression Testing, Regression Testing Types, Defining Regression Test Problem, Regression Testing Techniques.

TEST METRICS: Definition of Software Metrics, Classification of Software Metrics, Size Metrics.

UNIT V – TEST MANAGEMENT AND AUTOMATION (9 periods)

TEST MANAGEMENT: Test Organization, Structure of Testing Group, Test Planning, Detailed Test Design, Test Specifications.

AUTOMATED AND TESTING TOOLS: Need for Automation, Categorization of Testing Tools, Selection of Testing Tools, Costs Incurred in Testing Tools, Guidelines for Automated Testing, Overview of Some Commercial Testing Tools.

Case Study: Income Tax Calculator

Total Periods: 45

Topics for self-study are provided in lesson plan.

TEXTBOOKS:

1. Naresh Chauhan, *Software Testing: Principles and Practices*, Oxford University Press, 2nd Edition, 2016.
2. M. G. Limaye, "*Software Testing: Principles and Techniques and Tools*," Tata McGraw –Hill Education, 1st Edition, 2012

REFERENCE BOOKS:

1. Boris Beizer, *SoftwareTestingTechniques*, DreamTech Press, 2nd Edition, 2004.
2. Dr. K. V. K. K. Prasad, *Software Testing Tools*, Dreamtech, 2004.
3. Srinivasan Desikan and Gopalaswamy Ramesh, —*Software Testing – Principles and Practices*‖, Pearson Education, 2006.

ADDITIONAL LEARNING RESOURCES:

https://www.tutorialspoint.com/software_testing_dictionary/test_management.htm
https://lecturenotes.in/subject/129/software-testing-st

IV B. Tech. – I Semester

(16BT60501) **SOFTWARE TESTING**

(Common to IT and CSSE)

(Program Elective – 3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Software Engineering.

COURSE DESCRIPTION:

Software Testing Basics: Goals, Defects, Terminology, Methodology, STLC in SDLC, Verification & Validation; Software Testing Techniques: White box testing, Black Box Testing, Regression testing; Test Management: Test Planning, Design & Specifications; Test Automation: Tool selection & Guidelines.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on
- Software Testing Life Cycle.
- Testing Techniques.
- Test Management & Metrics.
- Regression Testing
- Test Automation

CO2. Analyze testing circumstances and their resultants in software development.

CO3. Design and develop the appropriate test cases in accordance to the software development model.

CO4. Use problem solving skills to control and monitor the testing process

CO5. Apply testing tools for testing the software quality.

CO6. Apply contextual knowledge to perform testing on software related to societal applications

DETAILED SYLLABUS:

UNIT I: INTRODUCTION TO SOFTWARE TESTING **(09 Periods)**

Evolution of Software Testing, Software Testing—Myths and Facts, Goals of Software Testing, Psychology for Software Testing, Software Testing Definitions, Model for Software Testing, Effective Software Testing vs. Exhaustive Software Testing. Effective Testing is Hard, Software Testing as a Process. **Terminology & Methodology**: Software Testing Terminology, Software Testing Life Cycle (STLC), Software Testing Methodology.

UNIT II: WHITE BOX TESTING (09 Periods)

Need of White-Box Testing, Logic Coverage Criteria, Basis Path Testing, Graph Matrices, Loop Testing, Data Flow Testing, Mutation Testing.

UNIT III: BLACK BOX TESTING (08 Periods)

Boundary Value Analysis (BVA), Equivalence Class Testing, State Table-Based Testing, Decision Table-Based Testing, Cause-Effect Graphing Based Testing, Error Guessing.

UNIT IV: SOFTWARE TEST MANAGEMENT & METRICS (10 Periods)

Test Management: Test Organization, Structure of Testing Group, Test Planning, Detailed Test Design, Test Specifications.
Software Metrics: Definition of Software Metrics, Classification of Software Metrics, Size Metrics.

UNIT V: REGRESSION AND AUTOMATION (09 Periods)

Regression Testing: Progressive vs. Regressive Testing, Regression Testing Produces Quality Software, Regression Testability, Objectives of Regression Testing, Regression Testing Types, Defining Regression Test Problem, Regression Testing Techniques.
Automation and Testing Tools: Need for Automation, Categorization of Testing Tools, Selection of Testing Tools, Costs Incurred in Testing Tools, Guidelines for Automated Testing, Overview of Some Commercial Testing Tools.

Total Periods: 45

TEXT BOOK

1. Naresh Chauhan, *Software Testing: Principles and Practices,* Oxford University Press, 2nd Edition, 2016.

REFERENCE BOOKS:

1. Boris Beizer, *Software Testing Techniques*, Dream Tech Press, 2nd Edition, 2004.
2. Dr. K. V. K. K. Prasad, *Software Testing Tools* , Dreamtech, 2004.

III B. Tech. – II Semester

(19BT61501) DATA VISUALIZATIONTECHNIQUES

(Professional Elective - 2)
(Common to CSSE&CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on "Numerical Methods, Probability and Statistics", and "Data Mining"

COURSE DESCRIPTION:
Data and Visualization Foundations; Spatial; Geospatial; Time-Oriented and Multivariate Data Visualization Techniques; Interaction Concepts and Techniques; Visualization Techniques; Visualization Systems

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO1. Apply data preprocessing techniques for data visualization.
CO2. Analyze data visualization techniques for Spatial and Geospatial data.
CO3. Analyze Time-oriented data by applying Multivariate Visualization Techniques.
CO4. Examine various interaction techniques to perform data transformations.
CO5. Evaluate different visualization techniques to improve data visualizations.
CO6. Analyze data on visualization systems by utilizing toolkits and libraries

DETAILED SYLLABUS:

UNIT I – INTRODUCTION, DATA AND VISUALIZATION FOUNDATIONS **(9 periods)**

Introduction: Definition - The Visualization Process - The Role of Cognition – The Scatterplot.
Data Foundations: Types of Data - Structure within and between Records - Data Preprocessing
Visualization Foundations: The Visualization Process - The Eight Visual Variables

UNIT II – SPATIAL AND GEOSPATIAL DATA VISUALIZATION TECHNIQUES **(9 periods)**

Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three Dimensional Data - Dynamic Data - Combining Techniques
Geospatial Data: Visualizing Spatial Data - Visualization of Point Data - Visualization of Line Data - Visualization of Area Data

UNIT III – TIME-ORIENTED AND MULTIVARIATE VISUALIZATION TECHNIQUES **(9 periods)**

Time-Oriented Data: Introduction - Characterizing Time-Oriented Data - Visualizing Time-Oriented Data
Multivariate Data: Point-Based Techniques - Line-Based Techniques – Region-Based Techniques - Combinations of Techniques

UNIT IV – INTERACTION CONCEPTS AND TECHNIQUES **(9 periods)**

Interaction Concepts: Interaction Operators - Interaction Operands and Spaces - A Unified Framework
Interaction Techniques: Screen Space - Object Space – Data Space - Attribute Space - Data Structure Space - Visualization Structure Space - Animating Transformations – Interaction Control

UNIT V – COMPARE AND EVALUATE VISUALIZATION TECHNIQUES, VISUALIZATION SYSTEMS **(9 periods)**

Comparing and Evaluating Visualization Techniques: Steps in Designing visualizations **-** User Tasks and Characteristics - Data Characteristics - Visualization Characteristics - Structures for Evaluating Visualizations

Visualization Systems: Systems Based on Data Type, Analysis Type - Text Analysis and Visualization – Toolkits - Libraries

Total Periods: *45*

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. Matthew Ward, Georges Grinstein and Daniel Keim, *Interactive Data Visualization Foundations, Techniques, and Applications*, Second Edition, CRC Press, 2015.

REFERENCE BOOKS:

1. Kieran Healy, *Data Visualization: A Practical Introduction*, First Edition, Princeton University Press, 2019.
2. Alexandru C. Telea, *Data Visualization: Principles and Practice*, Second Edition, CRC Press, 2015.

III B. Tech. – II Semester

(19BT61502) INFORMATION SECURITY

(Professional Elective - 2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Course on "Computer Networks" and "Operating System".

COURSE DESCRIPTION:
Computer security; Need of Security; Access Control; Security policies; Software vulnerabilities; Secure Electronic transactions; Secure socket layer; transport layer security; Privacy.

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

CO1: Apply the security requirements like confidentiality, integrity, and availability to secure network assets from threats and attacks.
CO2: Analyze virus, malicious software and worms for detecting distributed Daniel of service attacks.
CO3: Apply handshaking, alert and change cipher spec protocols and Coding function to secure SSL and TLS.
CO4: Apply PGP model and canonical forms to secure E-Mail data at transport layer.
CO5: Design firewall to secure the system by applying various intrusion detection systems.
CO6: Apply privacy techniques to protect information in the network.

DETAILED SYLLABUS:

UNIT I–INTRODUCTION **(9periods)**

Computer Security Concepts, the OSI Security Architecture, Security Attacks, Security Mechanism, Standards.

Malicious Software: Types of Malicious Software, Viruses, Worms, Distributed Denial of Service Attacks.

UNIT II – SECURITY AT TRANSPORT LAYER: SSL & TLS **(9 periods)**

Web Security Consideration, Secure Socket Layer and Transport Layer Security, Transport Layer Security, HTTPS, Secure Shell.

Wireless Network Security: IEEE 802.11 Wireless LAN Overview, IEEE 802.11i LAN Security, Wireless Application Protocol Overview, Wireless Transport Layer Security, WAP end-to-end Security

UNIT III – SECURITY AT APPLICATION LAYER: PGP AND S/MIME **(9 periods)**

Pretty Good Privacy, S/MIME, Domain keys Identified Mail

IP Security: IP Security Overview, IP Security Policy, IP Security Architecture, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

UNIT IV– INTRUDERSAND FIREWALLS **(9 periods)**

Intrusion Detection System: Intruders, Intrusion Detection, Password Management.

Firewalls: The Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Fire wall location and configuration.

UNIT V- PRIVACY **(9 periods)**

Evade Traffic analysis, Tunnel SSH through Tor, Encrypt you file seamlessly, Guard against Phishing, Use the web with fewer passwords, Encrypt your E-mail with Thunderbird, Encrypt you E-mail in Mac OS X

204

Total Periods: 45

Topics for self-study are provided in lesson plan.

TEXT BOOKS:

1. William Stallings "*Network Security Essentials (Applications and Standards)*", 4th Edition, Pearson Education 2011.
2. Andrew Lockhart "*Information security Hacks (Tips and Tools for protecting your privacy)",* 2nd Edition, 2004.

REFERENCE BOOKS:

1. Behrousz A Forouzan, D Mukhopadhyay, "***Cryptography and network Security***", McGraw Hill.
2. Network Security – Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.

ADDITIONAL RESOURCES:

1. http://www.inf.ufsc.br/~bosco.sobral/ensino/ine5680/material-cripto-seg/2014 1/Stallings/Stallings_Cryptography_and_Network_Security.pdf.
2. http://www.ijcsmc.com/docs/papers/January2015/V4I1201544.pdf.
3. http://nptel.ac.in/syllabus/106105031/.

III B. Tech. - II Semester

(16BT61502) **NETWORK SECURITY**

(Program Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Computer Networks

COURSE DESCRIPTION:

Foundations of Network Security; Security Technologies; Symmetric and Asymmetric key encryption algorithms; System Security with Firewalls; Intrusion Detection.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on types of attacks, firewalls, Symmetric encryption, Cryptography, message authentication and confidentiality

CO2. Analyze the principles of symmetric and public key cryptographic algorithms

CO3. Design appropriate algorithms suiting the security needs of the network.

CO4. Apply security schemes in firewall design to protect the organization's internet/network systems.

CO5. Use modern engineering techniques to identify Intrusion Detection, types of malicious software and apply suitable counter measures.

CO6. Apply ethical means to integrate network operations, administration and information assurance in a network.

DETAILED SYLLABUS:

UNIT I: NETWORK SECURITY FOUNDATIONS (10 Periods)

Network Security Overview: Benefits of good Security Practices, Security Methodology

Attacks: Define Access Attacks, Modification attacks, DoS attacks, Repudiation attacks, Hacking Techniques, Sniffing Switch Networks, IP spoofing

UNIT II: SECURITY TECHNOLOGIES (08 Periods)

Firewalls: Types of firewalls, Develop firewall configuration, design firewall ruleset

Virtual Private Network: Define VPN, Deploy User, site VPNs, Standard VPN techniques, types of VPN systems

UNIT III: SYMMETRIC KEY ENCRYPTION AND MESSAGE CONFIDENTIALITY (09 Periods)

Symmetric key Encryption Principles, Symmetric Block Encryption Algorithms, Random and Pseudorandom numbers, Stream Ciphers and RC4, Cipher block mode of operations

UNIT IV: PUBLIC KEY CRYPTOGRAPHY AND MESSAGE AUTHENTICATION (09 Periods)

Secure Hash functions, Message Authentication codes, public key cryptography principles and algorithms, Digital Signatures

UNIT V: SYSTEM SECURITY (09 Periods)

Intruders: Intrusion Detection, Password Management, Types of IDS, Setup IDS, manage IDS, Intrusion prevention
Malicious Software: Types of malicious software, viruses, Virus Counter measures, Worms

TEXT BOOKS:

1. William Stallings, *Network Security Essentials: Applications and Standards*, Pearson, 4th Edition, 2011.
2. Eric Maiwald, *Fundamentals of Network Security*, McGraw Hill Education, 2010.

REFERENCE BOOK:

1. Roberta Bragg, Mark Rhodes-Ousley, *Network Security: The Complete Reference,* McGraw Hill Education, 2004.

III B. Tech. – II Semester

(19BT61503) PARALLEL AND DISTRIBUTED SYSTEMS

(Professional Elective - 2)
(Common to CSSE, CSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A course on "Computer Organization and Architecture", "Operating Systems"

OURSE DESCRIPTION:
Parallel computing Architectures and Metrics; SIMD Architecture; Distributed system Models and Services; RPC, Scheduling schemes, load balancing, synchronization and communication services in distributed environment.

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

CO1: Analyze the characteristics and architectures of parallel and distributed models using performance metrics.
CO2: Solve computational problems on SIMD by applying Parallel Algorithms.
CO3: Analyze the distributed applications such as RPC, RMI and object-based middleware by employing middleware technologies.
CO4: Explore resource & process management of distributed systems by utilizing scheduling techniques.
CO5: Interpret the performance & reliability of Synchronization algorithms over the distributed systems.
CO6: Analyse the distributed file systems such as NFS, AFS, and HDFS based on conceptual knowledge on process and resource management.

DETAILED SYLLABUS:

UNIT I– INTRODUCTION TO PARALLEL COMPUTING (8 periods)
Introduction, Parallel Architecture, Architectural Classification Scheme, Performance of Parallel Computers, Performance Metrics for Processors, Parallel Programming Models, Serial and Parallel Algorithms

UNIT II –PARALLEL PROCESSING (8 periods)
Single Instruction Multiple Data Architecture, SIMD Architecture and Programming Principle, SIMD Parallel Algorithms, Gauss Jordan Method, Finding Roots of Non-Linear Equations, Data Mapping and Memory in Array Processors
Case Study: Optimization of Irregular Computation on SIMD Machine.

UNIT III –DISTRIBUTED SYSTEMS CONCEPTS (8 periods)
Definition, Issues, Goals, Types of distributed systems, Distributed System Models, Hardware concept, Software Concept, Models of Middleware, Services offered by middleware, Client-Server model

UNIT IV – COMMUNICATION, RESOURCE AND PROCESS MANAGAMENT (10 periods)
Communication: Introduction, Remote Procedure Call, Remote Object &Method Invocation, Message Oriented Communication, Stream Oriented Communication
Resource Management: Introduction, Taxonomy of Distributed Scheduling, Task assignment
Approach, Load Balancing Approach, Load Sharing Approach
Process Management: Threads, Virtualization, Clients, Servers, Code Migration

UNIT V –SYNCHRONIZATION AND DISTRIBUTED FILE SYSTEMS (11 periods)

Synchronization: Logical Clock, Election Algorithms: Bully Algorithm, Ring Algorithm, Mutual Exclusion, Distributed Mutual Exclusion Algorithms: Non-Token Based Algorithms, Token Based Algorithms, Singhal's Heuristic Algorithm, Raymond's Tree based Algorithm.

Case Studies: Network File System(NFS), Andrew File System(AFS), Hadoop Distributed File System (HDFS).

Total Periods: *45*

Topics for self-study are provided in lesson plan.

TEXT BOOKS:

1. Nupur Prasad Giri, Nikhilesh Joshi, Bhushan JadhavArun Kulkarni, *Parallel and Distributed Systems*, 2nd edition, Wiley, 2017.

REFERENCE BOOKS:

1. M.R. Bhujade, "*Parallel Computing*", 2nd edition, New Age International Publishers 2009.
2. Andrew S. Tanenbaum and Maarten Van Steen, "*Distributed Systems: Principles and Paradigms*, 2nd edition, Pearson Education, Inc., 2015.
3. AnanthGrama, Anshul Gupta, George Karypis and Vipin Kumar, *Introduction to Parallel Computing*, 2nd edition, Pearson Education, 2009.
4. HaggitAttiya *and Jennifer Welch, DistributedComputing – Fundamentals, Simulations and Advanced Topics*, 2nd edition, Wiley, 2012.

ADDITIONAL LEARNING RESOURCES:

Parallel Computing - https://nptel.ac.in/courses/106102114/

Distributed Computing Systems - https://nptel.ac.in/courses/106/106/106106107/

III B. Tech. – II Semester
(19BT61506) SYSTEMS RELIABILITY
(Professional Elecive-3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A Course on "System Programming".

COURSE DESCRIPTION:
Reliability and safety Technology; Failure Rate and Mean Time Between Failure; Costs and Safety; Realistic Failure Rates and Prediction Confidence; Inference and Confidence Levels; The Chi-Square Test; Reliability Demonstration; The Weibull Distribution; Block Diagrams; Allowing for Diagnostic Intervals; Human Factors; Comparing Predictions with Target.

COURSE OUTCOMES: After successful completion of this course, the students will be able to:
CO1: Analyze the reliability and safety of a system by applying cost effective approach and different estimation parameters.
CO2: Demonstrate the knowledge on the concepts data sources, prediction confidence for Interpreting failure rates
CO3: Apply statistical hypothesis test techniques to find the reliability of a system.
CO4: Analyze failure rates by using Weibull Distribution to improve system reliability.
CO5: Develop models to analyze and predict reliability of a system using Event tree diagrams.
CO6: Interpret human errors and enhance reliability by applying reliability predictive models and Risk Assessment Techniques.

DETAILED SYLLABUS:
UNIT I–Introduction to Reliability Parameters and Costs (9 periods)
Fundamentals of Reliability and safety Technology: Failure Data, Hazardous Failures, Reliability and Risk Prediction, Achieving Reliability and Safety-Integrity, The RAMS Cycle, Contractual and Legal Pressures
Failure and Jargon: Defining Failure and Failure Mode, Failure Rate and Mean Time between Failures, Interrelationships of Terms, the Bathtub Distribution, Down Time and Repair Time, Availability, Unavailability and Probability of Failure on Demand, Hazard and Risk-Related Terms, Choosing the Appropriate Parameter.
A Cost-Effective Approach to Quality, Reliability and Safety
Reliability and Optimum Cost, Costs and Safety, the Cost of Quality.

UNIT II –Interpreting Failure Rates and Demonstrating Reliability (9 periods)
Interpreting Failure Rates: Realistic Failure Rates and Prediction Confidence: Data Accuracy, Sources of Data, Data Ranges, Confidence Limits of Prediction, Manufacturers' Data, Overall Conclusions.
Interpreting Data and Demonstrating Reliability: The Four Cases, Inference and Confidence Levels, The Chi-Square Test, Understanding the Method in More Detail, Double-Sided Confidence Limits, Reliability Demonstration, Sequential Testing, Setting Up Demonstration Tests.

UNIT III –Variable Failure Rates and Prediction Theory (9periods)
Variable Failure Rates and Probability Plotting: The Weibull Distribution, Using the Weibull Method, More Complex Cases of the Weibull Distribution, Continuous Processes.
Basic Reliability Prediction Theory: Why Predict RAMS, Reliability of Series Systems, Redundancy Rules, and General Features of Redundancy.

UNIT IV– Methods of Modeling **(9 periods)**

Block Diagrams and Repairable Systems, Common Cause (Dependent) Failure, Fault Tree Analysis, Event Tree Diagrams.

UNIT V-Reliability Models and Risk Assessment **(9 periods)**

Quantifying the Reliability Models: The Reliability Prediction Method, Allowing for Diagnostic Intervals, FMEA (Failure Mode and Effect Analysis), And Human Factors: Models, HEART, THERP, TESEO, Comparing Predictions with Target.

Risk Assessment (QRA): Frequency and Consequence, Perception of Risk, ALARP and Cost per Life Saved, Hazard Identification, Factors to Quantify.

Total Periods: 45

Topics for self-study are provided in lesson plan.

TEXTBOOKS:

1. Reliability, Maintainability and Risk 8th Edition Practical Methods for Engineers including Reliability Centred Maintenance and Safety-Related Systems.
2. System Reliability Concepts by V. Sankar, Himalaya Publishing House, 2015.

REFERENCE BOOKS:

1. Practical Reliability Engineering, 5thEdition by Patrick O'Connor and Andre Kleyner, Wiley, 2012.
2. Reliability Engineering: Theory and Practice 8th edition. 2017 Edition by Alessandro Birolini, Springer.

ADDITIONAL RESOURCES:

1. https://qpr.buaa.edu.cn/
2. https://reliabilityweb.com/
3. https://slideplayer.com/.

III B. Tech. – II Semester

(19BT61506) USER INTERFACE DESIGN

(Professional Elective-3)
(Common to CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on "Computer Organization" & "Operating Systems"

COURSE DESCRIPTION:
Usability Goals and Measures; Physical Abilities and Physical Workplaces; the Design Process, Design Frameworks; 2-D and 3-D Interfaces; Keyboards and Keypads, Pointing Devices; Five-Stage Search Framework, Dynamic Queries and Faceted Search

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

CO1: Analyze the user requirements, technological and physical characteristics of users for better interface design
CO2: Analyze desktop and mobile applications by applying various user interface design methods
CO3: Analyze the usability of user-interfaces using qualitative Nielsen's guidelines and testing methodologies
CO4: Identify interaction and navigation styles to model the user interfaces
CO5: Apply speech recognition, command languages ,collaboration models to find the design consistency in user interfaces
CO6: Analyze search interfaces by applying five stage framework for effective data visualization

DETAILED SYLLABUS:

UNIT I: USABILITY OF INTERACTIVE SYSTEMS (9 Periods)

Usability Goals and Measures, Usability Motivations Universal Usability:Variations in Physical Abilities and Physical Workplaces, Diverse Cognitive and Perceptual Abilities, Personality Differences, Cultural and International Diversity, Users with Disabilities, Older Adult Users, Children, Accommodating Hardware and Software Diversity

UNIT II: DESIGN PROCESSES AND USER EXPERIENCE (09 Periods)

Organizational Support for Design, the Design Process, Design Frameworks, Design Methods, Design Tools, Practices, and Patterns, Social Impact Analysis, Legal Issues
Evaluation and the User Experience: Expert Reviews and Heuristics, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation during Active Use and Beyond, Controlled Psychologically Oriented Experiments

UNIT III: INTERACTION STYLES (9 Periods)

Direct Manipulation and immersive Environments: What Is Direct Manipulation? 2-D and 3-D Interfaces, Teleoperation and Presence, Augmented and Virtual Reality
Fluid Navigation: Navigation by Selection, Small Displays, Content Organization, Audio Menus, Form Fill-in and Dialog Boxes.
Case Study: Iterative Design Evaluation of Automated Teller Machines (ATMs)

UNIT IV: EXPRESSIVE HUMAN AND COMMAND LANGUAGES (9 Periods)

Speech Recognition, Speech Production, Human Language Technology, Traditional Command Languages
Device: Key boards and Keypads, Pointing Devices, Displays Communication and
Collaboration: Models of Collaboration, Specific Goals and Contexts, Design Considerations
Case Study: Design Consistency at Apple Computer

UNIT V: INFORMATION SEARCH AND DATA VISUALIZATION **(9 Periods)**

Five-Stage Search Framework, Dynamic Queries and Faceted Search, Command Languages and "Natural" Language Queries, Multimedia Document Search and Other Specialized Search, the Social Aspects of Search

Data Visualization: Tasks in Data Visualization, Visualization by Data Type, Visualization by Data Type, Challenges for Data Visualization

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOKS:

1. Schneiderman, Plaisant, Cohen, Jacobs, Elmqvist, *Designing the User Interface*, Pearson Education, 6th Edition, 2018.

REFERENCE BOOKS:

1. A Dix, Janet Finlay, G. D. Abowd and R. Beale, *Human- Computer Interaction*, Pearson Publishers, 3rd Edition, 2008.
2. Jonathan Wolpaw and Elizabeth Winter Wolpaw, *Brain-Computer Interfaces: Principles and Practice*, Oxford Publishers, 2012.

ADDITIONAL LEARNING RESOURCES

https://nptel.ac.in/courses/106103115/

IV B. Tech. – I Semester
(19BT71501) SYSTEM SIMULATION AND MODELING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Programming for Problem Solving, Numerical Methods, Probability and Statistics.

COURSE DESCRIPTION: Discrete event simulation; Useful statistical models; Queuing systems; Probabilistic model, Properties of random numbers, Test for random numbers; Input modeling, Types of simulations with respect to output analysis

COURSE OUTCOMES: After successful completion of the course, students will be able to:
CO1. Understand the concepts of discrete event simulation by using single–server queuing system and simulation software.
CO2. Develop a probabilistic model to solve real life problems and validate it.
CO3. Apply statistical models to represent the data for simulation.
CO4. Apply Techniques to generate Random variates for modeling a system
CO5. Apply goodness of fit tests for identified input data distribution
CO6. Analyze the techniques for output data analysis for a single system

DETAILED SYLLABUS:

UNIT I: BASIC SIMULATION MODELING (10 Periods)

Introduction: The nature of simulation, Systems, Models, and simulation, discrete event simulation, Simulation of a single-server queuing system: problem statement, Intuitive Explanation, Program Organization and Logic, simulation output and discussion, Alternative Stopping Rules, steps in simulation study, advantages, disadvantages, and pitfalls of simulation

Simulation software: introduction, comparison of simulation packages with programming languages, classification of simulation software, desirable software features.

UNIT II: MODELING A PROBABILISTIC SYSTEM (11 Periods)

Introduction: Random variables and their properties, simulation output data and stochastic processes, estimation of means, Variances, and correlations, confidence intervals and hypothesis tests for the mean

Validation of simulation Model: Definitions, guidelines for determining the level of model detail, verification of simulation computer programs, techniques for increasing model Validity and credibility

UNIT III: SELECTION OF INPUT PROBABILITY DISTRIBUTIONS (10 Periods)

Introduction, Probability distributions, Continuous distributions, discrete distributions hypothesizing families of distributions

UNIT IV: GENERATING RANDOM VARIATES (07 Periods)

Properties of random numbers, Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for random numbers, Inverse-transform technique, Acceptance rejection technique, Special properties.

UNIT V: OUTPUT DATA ANALYSIS FOR A SINGLE SYSTEM (07 periods)

Introduction, transient and steady-state behavior of a stochastic process, Types of simulations with respect to output analysis, statistical analysis for terminating simulations

Total Periods: ~~45~~

Topics for self-study are provided in lesson plan.

TEXT BOOK:

1. Averill M. Law, Simulation Modeling and Analysis, McGraw Hill Education (India) Private Limited, 5th edition, 2015.

REFERENCE BOOKS:

1. Jerry Banks, John S. Carson II, Barry L.Nelson and David M.Nicol, Discrete-Event System Simulation, Pearson India,5th edition, 2013.
2. Narsingh Deo, System Simulation with Digital Computer, Prentice Hall India 2009.

IV B. Tech. - I Semester

(16BT71501) SYSTEM MODELING AND SIMULATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Programming in C and Probability Distributions and Statistical Methods.

COURSE DESCRIPTION:
Discrete event simulation; R Studio Operations; Useful statistical models; Queueing systems; Properties of random numbers, Test for random numbers; Data collection, Types of simulations with respect to output analysis.

COURSE OUTCOMES:
On successful completion of this course, students will be able to:

CO1. Demonstrate knowledge on functional modeling of system design.
CO2. Analyze the performance of Queueing systems in real world applications.
CO3. Design dynamic system operations using simulation results using R.
CO4. Apply mathematical foundations and computer science theory in the modeling and design of experiments for real time systems.
CO5. Select suitable tools and simulation software for simulating computer based systems.
CO6. Relate appropriate professional principles of engineering practice for designing simulation models.

DETAILED SYLLABUS:

UNIT I: INTRODUCTION TO DISCRETE EVENT SIMULATION (08 Periods)

Simulation-Advantages and Disadvantages, Areas of application, Steps in a simulation study, Basics of spreadsheet simulation, Queueing simulation in a spread sheet, Concepts in discrete-event simulation, List processing, Selection of simulation software, Simulation environments.

UNIT II: THE R ENVIRONMENT (10 Periods)

Command line interface, R Studio, Basic Math, Variables, Data Types, Vectors, Calling Functions, Missing Data, Reading data into R, ggplot2, Function arguments, Return values, Control

statements, Loops, Correlation and covariance, T-Tests, ANOVA, Autoregressive moving average, VAR.

UNIT III: STATISTICAL MODELS (07 Periods)

Terminology and concepts, Useful statistical models, Discrete distributions, Continuous distributions, Poisson process, Empirical distributions.

UNIT IV: QUEUEING MODELS AND RANDOM NUMBERS (09 Periods)

Characteristics of queuing systems, Queueing notation, Long-run measures of performance of queueing systems. Properties of random numbers, Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for random numbers, Inverse-transform technique, Acceptance-rejection technique.

UNIT V: ANALYSIS OF SIMULATION DATA (11 Periods)

Input Modeling-Data Collection, Identifying the distribution with data, Parameter estimation, Multivariate and time series input models. Validation of Simulation Models -Model building verification and validation, Verification of simulation models. Estimation of absolute performance - Types of simulations with respect to output analysis, stochastic nature of output data, Absolute measures of performance and their estimation, Output analysis of terminating Simulations.

Total Periods: 45

TEXT BOOKS:

1. Jerry Banks, John S. Carson II, Barry L.Nelson and David M.Nicol, *Discrete-Event System Simulation,* Pearson India,5th Edition, 2013.
2. Jared P. Lander, *R for Everyone*, Pearson India, 2014.

REFERENCE BOOKS:

1. Narsingh Deo, System *Simulation with Digital Computer*, Prentice Hall India 2009.
2. Averill M. Law, *Simulation Modeling and Analysis*, McGraw Hill Education (India) Private Limited, 4th Edition, 2007.

IV B. Tech. – I Semester

(19BT71502) COMPUTATIONAL STATISTICS

(Professional Elective-4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A course on "Numerical Methods, Probability and Statistics"

COURSE DESCRIPTION:
Statistical Inference, detecting outliers; Type I and Type II errors, Randomized Block Design; Least Squares Method, Testing for Significance; residual analysis, variable selection procedures; Smoothing Methods, Kruskal-Wallis Test.

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

CO1. Analyze the qualitative and quantitative data by applying statistical parameters for detecting outliers and association between variables.
CO2. Analyze the population by applying hypothesis test techniques to predict the possible errors.
CO3. Interpret the data by applying ANOVA test techniques to determine the variable dependencies.
CO4. Select suitable linear regression model for solving computational problems.
CO5. Explore the seasonal components of time series data by applying statistical and qualitative approaches.
CO6. Analyze the random samples by applying non parametric methods to categorise the populations.

DETAILED SYLLABUS:

UNIT I–INTRODUCTION TODESCRIPTIVE STATISTICS (9 periods)

Introduction: Data, Data Sources, Descriptive Statistics, Statistical Inference, Computers and Statistical Analysis, Summarizing Qualitative Data, Summarizing Quantitative Data, Exploratory Data Analysis, Cross tabulations and Scatter diagrams.
Numerical Measures: Measures of location, Measures of Variability, Measures of Distribution shape, Relative Location, detecting outliers, Exploratory Data analysis, Measures of association between two variables, Weighted Mean and Grouped Data.

UNIT II –HYPOTHESIS TESTS AND ANALYSIS OF VARIANCE (9 periods)

Hypothesis Tests: Developing null and alternative Hypothesis, Type I and Type II errors, Population Mean-σ known and σ unknown, population proportion, Hypothesis testing and decision making, calculating the probability of Type II errors, determining the sample size.
Analysis of Variance: An Introduction to Experimental Design and Analysis of variance, Analysis of variance and completely randomized design, Multiple comparison procedures, Randomized Block Design, Factorial Experiment.

UNIT III –SIMPLE LINEAR REGRESSION (7 periods)

Simple Linear Regression Model, Least Squares Method, Coefficient of Determination, Model assumptions, testing for Significance, usage of estimated regression equation, computer solution, residual analysis.

UNIT IV –MULTIPLE LINEAR REGRESSION AND ANALYSIS (11 periods)

Multiple Linear Regression Model, Least Squares Method, Coefficient of Determination, Model assumptions, testing for Significance, usage of estimated regression equation, residual analysis.

Regression Analysis: General Linear Model, variable modifications, analysis of larger problems, variable selection procedures.

UNIT V –FORECASTING AND NON-PARAMETRIC TESTS **(9 periods)**

Components of Time series, Smoothing Methods, Trend Projection, Seasonal Components, Regression Analysis, Qualitative Approaches.

Non- Parametric Tests: Sign Test, Wilcoxon Signed-Rank Test, Mann-Whitney-Wilcoxon Test, Kruskal-Wallis Test, Rank Correlation.

Total Periods: 45

Topics for self-study are provided in lesson plan.

TEXTBOOKS:

1. Anderson, Sweeney, Williams, "*Statistics for Business and Economics*", 10th Edition, 2008.

REFERENCE BOOKS:

1. J.K. Sharma, "*Fundamentals of Business Statistics*", Pearson Publications, 2010
2. Naval Bajpai, "*Business Statistics", Pearson Publications*, 2010.

IV B. Tech. - I Semester

(19BT71503) DEEP LEARNING

(Common to CSE, CSSE & IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A course on "Machine Learning"

COURSE DESCRIPTION: Overview of machine learning; Fundamentals of deep learning; Modern approaches in deep learning; Feedforward neural network architectures; Deep learning Models and Applications.

COURSE OUTCOMES:

After successful completion of the course, students will be able to

- **CO1.** Analyze a neural network by applying the basics of mathematics and machine learning.
- **CO2.** Analyze the data using multilayer perceptron and backpropagation algorithms.
- **CO3.** Apply regularization and optimization techniques to improve the performance of Deep neural networks.
- **CO4.** Identify appropriate deep learning model for text, multimedia, and biological data analysis.
- **CO5.** Compare deep neural networks and deep learning models to infer the suitable learning algorithm on large scale data.
- **CO6.** Develop a model for domain specific applications by applying various network models in deep learning.

DETAILED SYLLABUS:

UNIT I – Introduction **(9 Periods)**

Historical Trends in Deep Learning – Machine Learning basics - Learning algorithms: Supervised and Unsupervised Training - Linear Algebra for Machine Learning - Testing - Cross Validation - Dimensionality Reduction - Over fitting /Under Fitting - Hyper parameters and validation sets - Estimators – Bias – Variance - Loss Function- Regularization

UNIT II Neural Networks **(9 Periods)**

Biological Neuron – Idea of Computational units - Linear Perceptron - Perceptron Learning Algorithm - Convergence theorem for Perceptron Learning Algorithm - Linear Separability - Multilayer perceptron – Backpropagation.

UNIT III Modern Practices in Deep Networks **(10 Periods)**

Introductions to Simple DNN - Platform for Deep Learning - Deep Learning Software Libraries - Deep Feed forward networks – Gradient-Based Learning - Architecture Design –Various Activation Functions, ReLU, Sigmoid – Error Functions - Regularization methods for Deep Learning - Early Stopping - Drop Out - Optimization methods for Neural Networks-Adagrad, Adam

UNIT IV Deep Learning Models **(9 Periods)**

Convolutional Neural Networks (CNNs): CNN Fundamentals – Architectures – Pooling – Visualization – Sequence Modeling: Recurrent Neural Networks (RNN) - Long-Short Term Memory (LSTM) – Bidirectional LSTMs-Bidirectional RNNs -Deep Unsupervised Learning: Autoencoders – Auto Encoder Applications -Deep Boltzmann Machine (DBM)

UNIT V Case Study and Applications **(8 Periods)**

Application Case Study - Handwritten digits recognition using deep learning - LSTM with Keras – Sentiment Analysis – Image Dimensionality Reduction using Encoders LSTM with Keras – Alexnet - VGGnet

Total periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, *Deep Learning*, 4th Edition, MIT Press,2016.

REFERENCE BOOKS:

1. KevinP.Murphy, "*MachineLearning: AProbabilisticPerspective*", MITPress,2012.
2. chael Nielsen, *Neural Networks and Deep Learning, Determination* Press, 2015.
3. Deng & Yu, *Deep Learning: Methods and Applications*, Now Publishers, 2013.

Additional Resources

1. https://www.youtube.com/watch?reload=9&v=aPfkYu_qiF4
2. http://www.deeplearning.net/tutorial/
3. https://www.guru99.com/deep-learning-tutorial.html
4. https://www.coursera.org/courses?query=deep%20learning

IV B. Tech. – I Semester

(19BT71504) HIGH PERFORMANCE COMPUTING

(Common to CSE, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A course on "Computer Organization"

COURSE DESCRIPTION:
Heterogeneous Parallel Computing, Architecture of Modern CPU; Data Parallelism, CUDA Program Structure; Device Global Memory and Data Transfer; Thread Scheduling and Latency Tolerance, Querying Device Properties; Computational Thinking, Basic Open ACC Programs, Future Directions of Open ACC

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

CO1: Explore parallel programming models to understand behavior of algorithms and application on parallel systems.
CO2: Analyze the functionality of GPU architecture using parallel computing platform CUDA
CO3: Design CUDA kernel functions to launch data parallel execution on multiple GPU's processor cores
CO4: Explore the concepts of CUDA thread organization and scheduling for data access in heterogeneous systems
CO5: Apply strategies of CUDA memories to boost the execution efficiency of kernel functions on parallel computers
CO6: Identify OpenCL API and OpenACC directivesto accelerate the applications on high performance architectures

DETAILED SYLLABUS:

UNIT I: PARALLEL COMPUTING **(08 Periods)**
Heterogeneous Parallel Computing, Architecture of Modern CPU, Why more parallelism, Speeding up real applications, Parallel programming languages and models

UNIT II: GPU COMPUTING **(10 Periods)**
Evolution of Graphics Pipelines, GPGPU: An intermediate Step, GPU Computing.
Introduction to Data Parallelism and CUDA C:Data Parallelism, CUDA Program Structure, A Vector Addition Kernel, Device Global Memory and Data Transfer, Kernel Functions and Threading

UNIT III: DATA-PARALLEL EXECUTION MODEL **(10 Periods)**
CUDA Thread Organization, Mapping Threads to Multidimensional Data, Matrix-Matrix Multiplication-A More Complex Kernel, Synchronization and Transparent Scalability, Assigning Resources to Blocks, Querying Device Properties, Thread Scheduling and Latency Tolerance

UNIT IV: CUDA MEMEORIES AND PARALLEL PROGRAMMING **(08 Periods)**
Importance of Memory Access Efficiency, CUDA Device Memory Types, A Strategy for Reducing Global Memory Traffic, A Tiled Matrix_ Matrix Multiplication Kernel, Memory as a Limiting Factor to Parallelism
Parallel Programming: Goals of Parallel Computing, Problem Decomposition, Algorithm Selection, Computational Thinking

UNIT V: AN INTRODUCTION TO OPENCL&PARALLEL PROGRAMMING WITH OPENACC **(09 Periods)**

Data Parallelism Model, Device Architecture, Kernel Functions, Device Management and Kernel Launch, Electrostatic Potential Map in OpenCL.

Open ACC: Open ACC Versus CUDA C, Execution Model, Memory Model, Basic Open ACC Programs, Future Directions of Open ACC

Total Periods: 45

Topics for self study are provided in lesson plan

TEXT BOOK:

1.David B. Kirk, Wen-mei W. Hwu, *Programming Massively Parallel Processors: A Hands-on Approach*, Elsevier Science,2nd Edition,2013.

REFERNCE BOOKS:

1. Charles Severance and Kevin Dowd, *High Performance Computing*, O'Reilly Media, 2nd Edition, 1998.

2. Kai Hwang and Faye Alaye Briggs, *Computer Architecture and Parallel Processing*, McGraw Hill, 1984

ADDITIONAL LEARNING RESOURCES

https://nptel.ac.in/courses/106/108/106108055/

https://www.cdac.in/index.aspx?id=hpc_nsf_scientific_affiliation_param

IV B. Tech. – I Semester

(16BT71210) HIGH PERFORMANCE COMPUTING

(Common to IT and CSSE)

(Program Elective - 4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITE: A course on Computer Organization.

COURSE DESCRIPTION: Cache-based Microprocessor Architecture; Memory Hierarchies; Multithreaded Processors; Common Sense Optimizations; The Role of Compilers; Data Access Optimization; Shared-memory Computers; Parallel Scalability; Introduction to OpenMP; Parallel Jacobi Algorithm; Introduction to MPI; MPI Performance Tools; MPI Parallelization of Jacobi Solver.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on:
- Modern Processors and code Optimization.
- Parallel computing paradigms.

CO2. Analyze computation problems and identify the suitable parallel processing approaches to achieve optimum computation.

CO3. Design Parallel processing algorithms for achieving high performance computing.

CO4. Solve shared memory problems using Parallel Programming.

CO5. Use OpenMP and MPI tools in Parallel Programming.

DETAILED SYLLABUS:

UNIT I: MODERN PROCESSORS (08 Periods)

Stored-program computer architecture, General-purpose cache-based microprocessor architecture, Memory hierarchies, Multicore processors, Multi-threaded processors, Vector processors.

UNIT II: BASIC OPTIMIZATION TECHNIQUES FOR SERIAL CODE (10 Periods)

Scalar profiling, Common sense optimizations, Simple measures, Large impact, The role of compilers, C++ optimizations, Data access optimization-balance analysis and light speed estimates, Storage order.

Case study: The Jacobi algorithm and Dense matrix transpose.

UNIT III: PARALLEL COMPUTERS (09 Periods)

Taxonomy of parallel computing paradigms, Shared-memory computers, Distributed-memory computers, Hierarchical systems, Networks. Basics of parallelization, Data Parallelism, Function parallelism, Parallel scalability.

UNIT IV: PARALLEL PROGRAMMING WITH OpenMP (09 Periods)

Introduction to OpenMP – Parallel execution, Data scoping, OpenMP work sharing for loops, Synchronization, Reductions, Loop scheduling and tasking.

Case study: OpenMP-parallel Jacobi algorithm, Efficient OpenMP programming-profiling OpenMP programs, Performance pitfalls.

Case study: Parallel sparse matrix-vector multiply.

UNIT V: DISTRIBUTED-MEMORY PARALLEL PROGRAMMING WITH MPI (09 Periods)

Message passing, Introduction to MPI, Examples - MPI parallelization of Jacobi solver; Efficient MPI Programming - MPI performance tools, communication parameters, Synchronization, Serialization, Contention, Reducing communication overheads, Understanding intranode point-to-point communication.

Total Periods: 45

TEXT BOOK:

1. Georg Hager and Gerhard Wellein, *Introduction to High Performance Computing for Scientists and Engineers*, Chapman & Hall / CRC Computational Science Series, 2012.

REFERNCE BOOKS:

1. Charles Severance and Kevin Dowd, *High Performance Computing*, O'Reilly Media, 2nd Edition, 1998.
2. Kai Hwang and Faye Alaye Briggs, *Computer Architecture and Parallel Processing*, McGraw Hill, 1984.

IV B. Tech. – I Semester

(19BT715AC) KERNEL PROGRAMMING

(Audit Course)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	2

PRE-REQUISITES:
A course on "Unix programming"

COURSE DESCRIPTION:
Open Source Software, GNU Public License; Introduction to BASH, Command-line shortcuts, User Ids and Group Ids;The/etc/passwd file, File management and manipulation, Moving users & its directories; PAM's Files and Their Locations, Configuring PAM, Configuring Logging Daemon; The CRON program, Virtualization Implementation, Kernel based Virtual Machines (KVM)

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

CO1. Gain knowledge on concepts of open source software and bash commands that are used to manipulate system operations at admin level.
CO2. Identify appropriate Tools and techniques to manage the multiple users on a single host.
CO3. Analyze bootstrapping process of the Linux operating system with GRUB and Linux Loader (LILO).
CO4. Analyze the performance of file system management by using CRON Program.
CO5. Implement the virtualization by applying kernel configuration concepts.

DETAILED SYLLABUS:

UNIT I– LINUX: THE OPERATING SYSTEM (6 Periods)

Open Source Software, GNU Public License, Upstream and downstream, Advantages of Open Source Software, Differences between Windows and Linux.
Introduction to BASH, Command-line shortcuts, File Types, Ownership and Permissions, File management and manipulation, Moving users & its directories, Miscellaneous Tools, Editors.

UNIT II –MANAGING USERS AND GROUPS (7 periods)

User Ids and Group Ids, The /etc/passwd file, The /etc/shadow file, The /etc/group file, User management Tools: Command-Line User Management, GUI User Managers, Users and Access Permissions: Understanding SetUID and SetGID Programs, Pluggable Authentication Modules: How PAM Works, PAM's Files and Their Locations, Configuring PAM

UNIT III –BOOTING AND SHUTTING DOWN (7 periods)

Boot Loaders: GRUB Legacy, GRUB 2,LILO, Bootstrapping, The init process, rc scripts: Writing your own rc Script, enabling and disabling services: Disabling a Service, Odd and Ends of Booting and Shutting Down: fsck, Booting into single-user Mode.

UNIT IV –FILE SYSTEMS (5 periods)

Makeup of file systems, managing file systems, adding a new disk, Volume Management, Creating file systems.
The init Daemon, xinetd and inetd, The Logging Daemon, Configuring Logging Daemon, the CRON program

UNIT V – COMPILING THE LINUX KERNEL **(5 periods)**

Kernel concepts: What is Kernel, Finding Kernel Source Code, Building the Kernel: Preparing to configure the kernel, Kernel Configuration, Compiling the kernel and Booting the kernel, Patching the Kernel: Downloading and applying the patches
Virtualization: Virtualization Implementation, Kernel based Virtual Machines (KVM)

Total Periods: 30

TEXT BOOKS:

1. Steve Shah and Wale Soyinka "Linux Administration: A Beginner's Guide", 4th Edition,Tata McGraw-Hill Publishing Company Limited, New Delhi, ISBN: 978-0072262599.
2. Susan Lauber, Philip Sweany, Rudolf Kastl and George Hacker, "REDHAT System Administration-1 Student Work book", REDHAT Inc. 2014

REFERENCE BOOKS:

1. The Linux Kernel Module Programming Guide, Peter Jay Salzman, Michael Burian, Ori Pomerantz
2. Linux System Programming, Robert Love, O"Reilly Media, Inc., Second Edition.

ADDITIONAL LEARNING RESOURCES:

1. udemy.com/topic/unix-programming/

III B. Tech. – II Semester

(19BT61531) INTERNET OF THINGS LAB

(Common to CE, ME, CSE, CSSE & IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	2	2

PRE-REQUISITES:-

COURSE DESCRIPTION:

Setting up **IoT** work-flow, Programming with Python, Micro-controller programming using Arduino, Building **IoT** Applications using Raspberry Pi, **IoT** Cloud Infrastructure.

COURSE OUTCOMES:

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

CO1. Design an interface to embedded systems using real time sensors with Arduino and
Raspberry Pi.

CO2. Develop applications to capture the data generated by sensors and send to cloud.

CO3. Develop real time applications using NodeMCU and BLYNK.

CO4. Design applications to push sensor data to cloud using MQTT protocol.

CO5.Work independently and in team to solve problems with effective communication.

Theory Component: **(10 Periods)**

Arduino IDE, 7-segment display, Servo motor, ultrasonic sensor, LCD, Flame sensor, gas sensor, Humidity & temperature sensors, MQTT protocols, ECG System, Raspberry Pi, Home security system with camera, PIR sensor, light sensor, motion detector, Node MCU, BLYNK, cloud

LIST OF EXPERIMENTS:

1. (a) Design and Simulate LED 7-Segment Display interfacing with Arduino.
   (b) Design and Simulate Servo motor interfacing with Arduino.
2. (a) Design and Simulate ultrasonic sensor and LCD interfacing with Arduino.
   (b) Design and Simulate Flame Sensor interfacing with Arduino.
3. Design and Implement to capture Gas Sensor and send sensor data to cloud from your Node MCU device using Arduino IDE.
4. Design and Implementation of Humidity and Temperature Monitoring Using Arduino and upload data to cloud using MQTT.
5. Design and Implementation of an IoT ECG (Electrocardiogram) System to record hearts electrical activity.
6. Design and Simulate controlling an LED 7-Segment Display with Raspberry Pi.
7. Design and implementation of Raspberry Pi Home Security System with Camera and PIR Sensor with Email Notifications.
8. Design and Implement to upload Light sensor (TSL) data to cloud through Raspberry Pi.
9. Design and Implementation of Motion Detector with Node MCU and BLYNK.
10. Design and Implementation of Fire notification IoT system with BLYNK.

REFERENCE BOOKS:

1. Adrian McEwen and Hakin Cassimally, *Designing the Internet of Things,* Wiley India.
2. Simon Monk, *Programming Aurdino,* Second Edition, McGraw-Hill Education,2016.
3. Matt Richardson and Shawn Wallace, *Getting Started with Raspberry Pi*, O'Reilly, 2014.
4. Rahul Dubey, *An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications* , Cengage Learning India Pvt. Ltd,2019

IV B. Tech. – I Semester
(19BT71531) SYSTEM SIMULATION AND MODELING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: Course on "System simulation Modeling"

COURSE DESCRIPTION: Discrete event simulation; Useful statistical models; Queuing systems; Probabilistic model, Properties of random numbers, Test for random numbers; Input modeling, output analysis

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Develop a probabilistic model to solve real life problems and validate it.
CO2. Apply statistical models to represent the data for simulation.
CO3. Apply Techniques to generate Random variates for modeling a system.
CO4. Apply goodness of fit tests for classified input data distribution.
CO5. Analyze the techniques for output data analysis for a single server system.
CO6. Work independently or in team to solve problems with effective communication.

DETAILED SYLLABUS:

1. Generation of random numbers using linear congruential method
2. Simulate the Random variates following:
    1. Binomial distribution
    2. Geometric distribution
    3. Poisson distribution
    4. Uniform distribution
    5. Normal and log normal distribution
3. Simulate the Random variates following
    1. Erlangs distribution
    2. Gamma distribution
    3. Weibull distribution
    4. Beta distribution
    5. Triangular distribution
4. A production process manufactures computer chips on the average at 2% nonconforming. Every day, a random sample of size 50 is taken from the process. If the sample contains more than two nonconforming chips, the process will be stopped. Simulate the process to compute the probability that the process is stopped by the sampling scheme.
5. A computer repair person is "beeped" each time there is a call for service. The number of beeps per hour is known to occur in accordance with a Poisson distribution with a mean of x = 2 per hour. Simulate the process to find the probability of two or more beeps in a 1-hour period.
6. A bus arrives every 20 minutes at a specified stop beginning at 6:40 A.M. and continuing until 8:40 A.M. A certain passenger does not know the schedule, but arrives randomly between 7:00A.M. and 7:30 A.M. every morning. Simulate the process to compute the probability that the passenger waits more than 5 minutes for a bus? ·
7. Consider a single-server queue with Poisson arrivals at an average rate of one per every 10 minutes and service times that are normally distributed, with mean of 9.75 minutes and standard deviation of 1.75 minute. This is an M/G/ 1 queue with long run utilization is 0.95. Suppose that a total of 10 independent replications. The total simulation run length on each replication was 15,000 minutes. The response variable was queue length, LQ (t, r), at time t, where the second argument, r, denotes the replication (r = 1, ..., 10). The raw output data

were hatched, as in intervals of 1000 minutes. Assume data for each replication and 15 batches for each replication. Conduct output analysis for steady state simulation.

8. Five numbers 0.44, 0.81, 0.14, 0.05, 0.93 were generated, and it is desired to perform a test for uniformity by using the Kolmogorov-Smirnov test with the level of significance. a = 0.05.
9. Records pertaining to the monthly number of job-related injuries at an underground coal mine were being studied by a federal agency. The values for the past six months were as follows:

Injuries per month	Frequency of occurrence
0	35
1	40
2	13
3	6
4	4
5	1
6	1

   a. Apply chi-square test to these data to test the hypothesis that the underlying distribution is poison. Use the level of significance á = 0.05.
   b. Apply chi-square test to these data to test the hypothesis that the distribution is poison with mean1.0. Again, let á = 0.05.
   c. What are the differences between parts (a) and (b), and when might each case arise?

10. The union Bank opens at 10:00 A.M. (time 0) with no customers present and 4 of the 9 tellers working (initial conditions) and closes at 4:00 P.M. (time T== 300 minutes). Here the event E is merely the fact that the bank has been open for 300 minutes. Develop a simulation model for the interaction between customers and tellers over the entire day, including the effect of starting up and of closing down at the end of the day.

TEXT BOOK:

1. Averill M. Law, Simulation Modeling and Analysis, McGraw Hill Education (India) Private Limited, 5th edition, 2015.

REFERENCE BOOKS:

1. Jerry Banks, John S. Carson II, Barry L.Nelson and David M.Nicol, Discrete-Event System Simulation, Pearson India,5th edition, 2013.
2. Narsingh Deo, System Simulation with Digital Computer, Prentice Hall India 2009.

IV B. Tech. - I Semester

(16BT71531) SYSTEM MODELING AND SIMULATION LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PRE-REQUISITES: A course on Programming in C Lab and System Modeling and Simulation

COURSE DESCRIPTION:
Hands on Experience on Generation of random numbers; Input Modeling; Queuing System; Simulation models.

COURSE OUTCOMES:
On successful completion of this course, students will be able to:

CO1. Demonstrate Knowledge to solve complex engineering problems using Modeling and simulation.
CO2. Analyze the problems to develop models for applications to meet requirements of the system.
CO3. Design and develop solutions through modeling for computer based systems.
CO4. Apply simulation methods to interpret data and provide valid conclusions for problems in systems engineering
CO5. Use modern engineering techniques in modeling systems to provide effective solutions for real world problems.
CO6. Apply appropriate ethics and follow principles to model systems incrementally.

List of Experiments:

1. A baker is trying to figure out how many dozens of bagels to bake each day. The probability distribution of the number of bagel customers is as follows:

Number of Customers/Day	8	10	12	14
Probability	0.35	0.30	0.25	0.10

Customers order 1,2,3 or 4 dozen bagels according to the following probability distribution.

Number of Dozen Ordered /Customer	1	2	3	4
Probability	0.4	0.3	0.2	0.1

Bagels sell for $8.40 per dozen. They cost $5.80 per dozen to make. All Bagels not sold at the end of the day are sold at half price to a local grocery store. Based on 5 days of simulation, how many dozen bagels should be baked each day?

2. Develop a function for generation of pseudo-random numbers between 0 and 1.

3. Develop functions for generating random variates for continuous and discrete probability distributions using inverse transform technique and acceptance-rejection technique.

4. A self service car wash has 4 washing stalls. When in a stall, a customer may choose from among three options: 1. Rinse only 2. Wash and Rinse 3. Wash, Rinse and Wax. Each option has a fixed time to complete: Rinse only 3 minutes; wash and rinse 7 minutes; wash, rinse and wax 12 minutes. The owners have observed that 20% of customers choose rinse only; 70% wash and rinse; and 10% wash, rinse and wax. There are no scheduled appointments; the customers arrive at a rate of about 34 cars per hour. There is room for only 3 cars to wait in the parking lot, so, currently many customers are lost. The owners want to know how much more business they will do if they add another stall. Adding a stall will take away one space in the parking lot.

   Develop a queuing model of the system. Estimate the rate at which customers will be lost in the current and proposed system. Carefully state any assumptions or approximations you make.

5. Records pertaining to the monthly number of job-related injuries at an underground coal mine were being studied by a federal agency. The values for the past 100 months were as follows:

Injuries per month	Frequency of occurrence
0	35
1	40
2	13
3	6
4	4
5	1
6	1

III B. Tech. – I Semester

(19BT50502) ARTIFICIAL INTELLIGENCE

(Professional Elective – 1)

(Common to CSE, CSSE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A Course on "Discrete Mathematical Structures"

COURSE DESCRIPTION: Introduction to artificial intelligence, Designing intelligent agents, Solving general purpose problems, Search in complex environments, Probabilistic reasoning, Represent knowledge and reason under uncertainty, Robotics, Ethics and safety in AI.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Architect intelligent agents using artificial intelligence techniques and principles.
CO2. Analyze and interpret the problem, identify suitable solutions using heuristic functions, optimization algorithms and search algorithms.
CO3. Select and apply appropriate knowledge representation to build Bayesian network models to reason under uncertainty.
CO4. Investigate robot hardware and frameworks for intelligent robotic perception.
CO5. Demonstrate knowledge on ethical implications of intelligent machines for providing privacy, trust, security and safety.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE **(10 periods)**

Foundations of artificial intelligence, History of artificial intelligence, State of the art, Risks and benefits of AI, Intelligent agents – Agents and environments, The concept of rationality, Structure of agents.

UNIT–II: PROBLEM SOLVING BY SEARCHING **(9 periods)**

Problem solving agents, Search algorithms, Uninformed search strategies, Informed search strategies – Greedy best-first search, A* search; Heuristic functions.

UNIT–III: SEARCH IN COMPLEX ENVIRONMENTS **(9 periods)**

Local search algorithms and optimization problems – Hill-climbing search, Simulated annealing, Local beam search, Evolutionary algorithms; Optimal decisions in games – Theminimax search algorithm, Optimal decisions in multiplayer games, Alpha-Beta pruning, Move ordering; Monte Carlo tree search.

UNIT–IV: PROBABILISTIC REASONING **(9 periods)**

Representing Knowledge in an uncertain domain, Semantics of Bayesian networks, Probabilistic reasoning over time – Timeand uncertainty, Inference in temporal models, Hidden Markov models, Kalman Filter.

UNIT–V: ROBOTICS, ETHICS AND SAFETY IN AI **(8 periods)**

Robotics: Robots, Robot hardware, Robotic perception, Alternative robotic frameworks, Application domains.

Ethics and Safety in AI: Limits of AI, Ethics of AI – Surveillance, security and privacy, Fairness and bias, Trust and transparency, AI safety.

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOK:

1. Stuart Russell, Peter Norvig, *Artificial Intelligence: A Modern Approach*, Prentice Hall, 4th Edition, 2020.

REFERENCE BOOKS:

1. Stephen Lucci, Danny Kopec, *Artificial Intelligence in the 21st Century*, Mercury Learning and Information, 3rd Edition,2018.
2. Rich, Knight, Nair,*Artificial intelligence*, Tata McGraw Hill, 3rdEdition, 2009.
3. Deepak Khemani, *A First Course in Artificial Intelligence*, McGraw Hill, 2017.
4. Saroj Kaushik,*Artificial Intelligence,* Cengage Learning, 2011.

ADDITIONAL RESOURCES:

- https://searchenterpriseai.techtarget.com/definition/AI-Artificial-Intelligence
- http://aima.cs.berkeley.edu/
- https://ai.google/education/
- https://www.coursera.org/courses?query=artificial%20intelligence
- https://www.edureka.co/blog/artificial-intelligence-with-python/

IMPROVEMENTS OVER SVEC16 SYLLABUS:

New course introduced in SVEC19.

IV B. Tech.–I Semester
(19BT50503) CYBER SECURITY
(Professional Elective – 4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:A Course on "Computer Networks"

COURSE DESCRIPTION: Cybercrime, Cyber offenses, Phishing, Identity theft, Cybercrime in mobile and wireless devices, Organizational measures for handling mobile devices, Security implications on using mobile devices, Tools and methods used in cybercrime, Forensics of computer and handheld devices, Real-life examples of cybercrime.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Analyze methods of cybercrime, cyber offenses to maintain cybersecurity.
CO2. Investigate tools used for cybercrime to protect computational assets.
CO3. Apply appropriate authentication mechanisms to reduce attacks on mobile and wireless devices.
CO4. Use appropriate cyber forensics tools and techniques to maintain cybersecurity.
CO5. Recognize the need for cybersecurity and practice ethics to protect privacy, property rights in cyberspace.

DETAILED SYLLABUS:

UNIT–I: CYBERCRIME **(8 periods)**

Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Need for Cyberlaws in Indian context, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Positive aspects and weak areas of ITA 2000, Amendments made in Indian ITA 2000 for admissibility of e-records, Amendments to the Indian IT Act, Global perspective on cybercrimes, Intellectual property in cyberspace, Ethical dimension of cybercrimes.

UNIT–II: CYBEROFFENSES **(11 periods)**

Categories of cybercrime, How criminals plan the attacks, Social engineering, Cyberstalking, Cybercafe and cybercrimes, Botnets, Attack vector, Cloud computing, Phishing – Methods, Techniques, Spear phishing, Phishing scams, Phishing toolkits, Spy phishing, Countermeasures; Identity Theft – Personally identifiable information, Types, Techniques, Countermeasures, Effacing online identity.

UNIT–III: CYBERCRIME IN MOBILE AND WIRELESS DEVICES **(7 periods)**

Proliferation of mobile and wireless devices, Trends in mobility, Credit card frauds in mobile and wireless computing era, Security challenges posed by mobile devices, Registry settings for mobile devices, Authentication service security, Attacks on mobile/cell phones, Security implications of mobile devices for organizations, Organizational measures for handling mobile devices related security issues.

UNIT–IV: TOOLS AND METHODS USED IN CYBERCRIME **(10 periods)**

Proxy servers and anonymizers, Password cracking, Keyloggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attacks on wireless networks.

UNIT–V: CYBERFORENSICS, CYBERCRIMEIN REAL-WORLD **(9 periods)**

Forensics of Computer and Handheld Devices: Cyber forensics, Cyber forensics and digital evidence, Forensics analysis of e-mail, Forensics and social networking sites,

Forensics of handheld devices – Smartphone forensics, EnCase, Device Seizure, MOBILedit.

Cybercrime examples, mini-cases, online scams: Real-life examples - Official website of Maharashtra Government hacked, Indian banks lose millions of rupees, Game source code stolen; Mini-cases - Indian Case of online gambling, Indian case of intellectual property crime;Online scams - Cheque cashing scam, Charity scams.

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOK:

1. Nina Godbole, SunitBelapure, *Cyber Security*: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley, 2013.

REFERENCE BOOKS:

1. Nilakshi Jain, Ramesh Menon, *Cyber Security and Cyber Laws*, Wiley, 2020.
2. Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, *Cybersecurity Essentials*, 1st Edition, Sybex, 2018.
3. ErdalOzkaya,*Cybersecurity: The Beginner's Guide*, 1st Edition,Packt Publishing, 2019.

ADDITIONAL LEARNING RESOURCES:

- Yuri Diogenes, ErdalOzkaya, *Cybersecurity: Attack and Defense Strategies*, 2nd Edition, Packt Publishing, 2019.
- http://www.ignou.ac.in/upload/Announcement/programmedetails.pdf
- Alessandro Parisi, *Hands-On Artificial Intelligence for Cybersecurity*, Packt Publishing, 2019.

III B. Tech. –II Semester

(19BT60502) MACHINE LEARNING

(Common to CSE, CSSE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on "Numerical Methods, Probability and Statistics", "Discrete Mathematical Structures", "Design and Analysis of Algorithms"

COURSE DESCRIPTION: Concept learning, General to specific ordering, Decision tree learning, and Support vector machine, Artificial neural networks, Multilayer neural networks, Bayesian learning, Instance based learning, reinforcement learning.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Analyze the concept learning algorithms to automatically infer a general description for a given learning problem.

CO2. Analyze the underlying mathematical models within machine learning algorithms and learning tasks.

CO3. Evaluate and apply suitable machine learning algorithms for various types of learning tasks.

CO4. Design efficient neural architectures to model patterns for a given learning problem.

CO5. Select and apply machine learning algorithms to solve societal problems such as face recognition, text classification.

DETAILED SYLLABUS:

UNIT–I:CONCEPT LEARNING AND GENERAL-TO-SPECIFIC ORDERING **(9 periods)**

Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning, Concept learning task, Concept learning as search, FIND-S, Version spaces and candidate elimination algorithm, Inductive bias.

UNIT–II:DECISION TREE LEARNING AND KERNEL MACHINES **(9 periods)**

Decision Tree Learning: Decision tree representation, Problems for decision tree learning, Decision tree learning algorithm, Hypothesisspace search, Inductive bias in decision tree learning, Issues in decision tree learning.

Kernel Machines: Support vector machines – SVMs for regression, SVMs for classification, Choosing C, A probabilistic interpretation of SVMs.

UNIT–III: ARTIFICIAL NEURAL NETWORKS **(9 periods)**

Neural network representations, Appropriate problems for neural network learning, Perceptrons, Multilayer networks and Backpropagation algorithm, Convergence and local minima, Representational power of feedforward networks, Hypothesis space search and inductive bias, Hidden layer representations, Generalization, Overfitting, Stopping criterion, An Example -Face Recognition.

UNIT–IV: BAYESIAN LEARNING **(10periods)**

Bayes theorem and concept learning, Maximum likelihood and least-squared error hypothesis, Maximum likelihood hypotheses for predicting probabilities, Minimum Description Length principle, Bayes optimal classifier, Gibbsalgorithm, Naive Bayes classifier, An Example – Learning to classify text; Bayesian belief networks, EMAlgorithm.

UNIT–V:INSTANCEBASED LEARNING AND REINFORCEMENT LEARNING **(8 periods)**

Instance Based Learning: k-Nearest Neighbor learning, Locally weighted regression, Radial basis functions, Case-based reasoning.

Reinforcement Learning: The learning task, Q-learning, Nondeterministic rewards and actions, Temporal difference learning, Generalizing from examples, Relationship to dynamic programming.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Tom M. Mitchell,*Machine Learning*, McGrawHill,2013.
2. Kevin P. Murphy, *Machine Learning*: *A Probabilistic Perspective*, MIT Press, 2012.

REFERENCE BOOKS:

1. EthemAlpaydin, *Introduction to Machine Learning*, MIT Press, 4thEdition, 2020.
2. Shai Shalev Shwartz, Shai Ben David, *Understanding Machine Learning: From Theory to Algorithms,* Cambridge University Press, 2014.

ADDITIONAL LEARNING RESOURCES:

- https://swayam.gov.in/nd1_noc19_cs52/preview
- https://www.udemy.com/course/machinelearning/

IV B. Tech.–I Semester

(19BT70501) AUGMENTED REALITY AND VIRTUAL REALITY

(Professional Elective - 5)
(Common to CSE, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on "Transformation Techniques and Linear Algebra", "Machine Learning", "Web Technologies"

COURSE DESCRIPTION: Augmented reality - Displays, Visual perception, Tracking methods, Computer vision algorithms, Interaction, Authoring, Navigation and Collaboration methods; Virtual reality - Stereoscopic displays, Computing platforms, Virtual reality hardware, Basics of 3D graphics, Basics of Unity 3D, GearVR and WebVR.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Analyze the augmented reality display environment, applications and tracking methods for spatial measurement and alignment of objects.
CO2. Analyze optical tracking and scene reconstruction algorithms for electronically perceiving imagery from camera sensors.
CO3. Investigate interaction, authoring, navigation and collaboration methods for providing human computer interaction in augmented reality systems.
CO4. Demonstrate knowledge on the fundamental concepts and hardware of virtual reality medium.
CO5. Develop virtual reality modules using Oculus SDK and WebVR API to provide simulated experience.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO AUGMENTED REALITY (9 periods)

History of augmented reality, Examples, Related fields – Mixed reality, Virtual reality, Ubiquitous computing; Displays – Multimodal displays, Visual perception, Requirements and characteristics, Spatial display model, Visual displays.

UNIT–II: COMPUTER VISION FOR AUGMENTED REALITY (10 periods)

Tracking – Tracking, calibration and registration, Coordinate systems, Characteristics of tracking technology, Stationary tracking systems, Mobile sensors, Optical tracking, Sensor fusion; Marker Tracking, Multiple-camera Infrared tracking, Natural feature tracking by detection, Incremental tracking, Outdoor tracking.

UNIT–III:HUMAN COMPUTER INTERACTION FOR AUGMENTED REALITY (9 periods)

Interaction – Input modalities, Output modalities, Haptic interaction, Multimodal interaction; Authoring – Requirements of AR authoring, Elements of authoring, Stand-alone authoring solutions, Plug-In approaches; Navigation – Foundations of human navigation, Route visualization, Viewpoint guidance, Multiple perspectives; Collaboration – Co-located collaboration, Remote collaboration.

UNIT–IV: INTRODUCTION TO VIRTUAL REALITY (8 periods)

Stereoscopic displays, Motion tracking hardware, Input devices, Computing platforms, Virtual reality applications, Virtual reality hardware – Oculus Rift, Crescent Bay, Samsung GearVR, Google Cardboard; 3D graphics basics – Coordinate systems, Meshes, Polygons, Vertices, Materials, Textures, Lights, Transforms, Matrices, Cameras, Perspective, Viewports and Projections, Stereoscopic Rendering; Unity 3D, Setting up the Oculus SDK, Example VR Application.

UNIT–V: Gear VR AND WebVR IN VIRTUAL REALITY (9 periods)

GearVR – GearVR user interface and Oculus Home, Oculus Mobile SDK, Developing for GearVR using Unity3D, Deploying applications for GearVR; WebVR– WebVR API, Creating WebVRapplication, Tools and techniques for creating WebVR.

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOKS:

1. Dieter Schmalstieg, Tobias Hollerer, *Augmented Reality: Principles and Practice*, Addison Wesley, 2016.
2. Tony Parisi, *Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web and Mobile*, O'Reilly, 2015.

REFERENCE BOOKS:

1. Grigore C. Burdea, PhilippeCoiffet, *Virtual Reality Technology*, 2nd Edition, Wiley, 2006.
2. Helen Papagiannis, *Augmented Human: How Technology Is Shaping the New Reality*, O'Reilly, 2017.

ADDITIONAL LEARNING RESOURCES:

- https://nptel.ac.in/courses/106106138/
- https://www.oreilly.com/library/view/augmented-human/9781491928363/ch01.html

IV B. Tech. – I Semester

(19BT70502) DATA SCIENCE

(Professional Elective – 5)
(Common to CSE & CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on "Transformation Techniques and Linear Algebra", "Numerical Methods, Probability and Statistics"

COURSE DESCRIPTION: Concepts of data science, Extracting meaning from data, The dimensionality problem, Plotting with pandas and seaborn, Probability distributions, Time series analysis, Predictive modeling.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Demonstrate knowledge on the concepts of data science to perform data analysis.
CO2. Develop methods to extract meaning from data using feature selection techniques.
CO3. Create data visualization using charts, plots and histograms to identify trends, patterns and outliers in data using Matplotlib and Seaborn.
CO4. Develop distribution functions to analyze and interpret data to extract meaningful statistics.
CO5. Design and develop predictive models for a given problem to support prediction and forecasting.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION **(9 periods)**

Definition of data science, Skills for data science, Tools for data science, Data types, Data collections, Data preprocessing, Data analysis and data analytics, Descriptive analysis, Diagnostic analytics, Predictive analytics, Prescriptive analytics, Exploratory analysis, Mechanistic analysis.

UNIT–II: DATA EXTRACTION **(9 periods)**

Extracting meaning from data – Features election, User retention, Filters, Wrappers, Entropy, Decision tree algorithm; Random forests, The dimensionality problem, Single value decomposition, Principal component analysis.

UNIT–III: DATA VISUALIZATION **(8 periods)**

A Brief matplotlib API primer, Plotting with Pandas and Seaborn – Line plots, Bar plots, Histograms and density plots, Scatter plots, Facet grids and Categorical data; Other Python visualization tools.

UNIT–IV: STATISTICAL THINKING **(11 periods)**

Distributions – Representing and plotting histograms, Outliers, Summarizing distributions, Variance, Reporting results; Probability mass function – Plotting PMFs, Other visualizations, The class size paradox, Data frame indexing; Cumulative distribution functions - Limits of PMFs, Representing CDFs, Percentile based statistics, Random numbers, Comparing percentile ranks; Modeling distributions - Exponential distribution, Normal distribution, Lognormal distribution.

UNIT–V: TIME SERIES ANALYSIS AND PREDICTIVE MODELING **(8 periods)**

Time series analysis – Importing and cleaning, Plotting, Moving averages, Missing values, Serial correlation, Autocorrelation; Predictive modeling – Overview, Evaluating predictive models, Building predictive model solutions, Sentiment analysis. 253

Total periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOKS:

1. Chirag Shah, *A Hands-on Introduction to Data Science*, Cambridge University Press, 2020.
2. Alen B. Downey, *Think Stats: Exploratory Data Analysis*, O'Reilly, 2nd Edition, 2014.

REFERENCE BOOKS:

1. Wes McKinney, *Python for Data Analysis*, O'Reilly, 2nd Edition, 2017.
2. OferMendelevitch, Casey Stella, Douglas Eadline, *Practical Data science with Hadoop and Spark: Designing and Building Effective Analytics at Scale*, Addison Wesley, 2017.
3. Rachel Schutt, Cathy O'Neil,*Doing Data Science: Straight Talk from the Frontline*, O'Reilly, 2014.
4. JakeVanderPlas, *Python Data Science Handbook: Essential Tools for Working with Data*, O'Reilly, 2017.

ADDITIONAL LEARNING RESOURCES:

- https://swayam.gov.in/nd1_noc19_cs60/preview
- https://towardsdatascience.com/
- https://www.w3schools.com/datascience/
- https://github.com/jakevdp/PythonDataScienceHandbook
- https://www.kaggle.com

IV B.Tech. –I Semester
(19BT70503) BLOCKCHAIN TECHNOLOGIES

(Program Elective – 5)
(Common to CSE, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A Course on "Cryptography and Network Security"

COURSE DESCRIPTION: Introduction to Blockchain Technologies and its decentralization concepts, Digital Currencies, Smart Contracts, Ethereum, Hyperledger, Alternative Blockchains, Current Challenges and Scope of Research.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Analyze the concepts of distributed systems, decentralization and blockchains in the Blockchain ecosystem.
CO2. Devise suitable Blockchain platforms for scalable applications.
CO3. Assess the challenges, trending technologies for understanding the research scope in Blockchain technologies.
CO4. Pertain to ethical and legal usage of Blockchain applications.
CO5. Formulate secured and sustainable Blockchains for healthy and safe society.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTIONTO BLOCKCHAIN AND DECENTRALIZATION **(9 Periods)**

Introduction to Blockchain: Distributed systems, History of Blockchain, Introduction to Blockchain - Definitions, Generic elements, Features, Applications, Tiers; Types of Blockchain, CAP theorem and Blockchain, Benefits and limitations of Blockchain technology.

Decentralization: Decentralization using Blockchain, Decentralization methods and routes, Full ecosystem decentralization, Smart contract, Decentralized organizations, Decentralized autonomous organizations, corporations and societies, Applications and platforms for decentralization.

UNIT–II: DIGITAL CURRENCY–BITCOIN **(9 Periods)**

Definitions, Transactions – Life cycle, Structure, Types; Blockchain – Structure of block and block header, Genesis block, Bitcoin network, Wallets; Bitcoin Payments – Investment and buying and selling bitcoins, Installation; Bitcoin Limitations, Namecoin.

UNIT–III: SMART CONTRACTS ANDETHEREUM **(11 Periods)**

Smart Contracts: History & definition, Ricardian contracts - Smart contract templates, Oracles, Smart Oracles, Deployment of smart contracts on Blockchain.

Ethereum: Introduction, Ethereum Blockchain, Elements of Ethereum Blockchain, Precompiled contracts, Accounts, Block, Ether, Messages, Mining – Ethash, CPU and GPU mining; Clients and wallets, Ethereum Network, Applications developed on Ethereum, Scalability and security issues.

UNIT–IV: HYPERLEDGERS AND ALTERNATIVE BLOCKCHAINS **(8 Periods)**

Hyper ledgers: Projects, Hyperledger as protocol, Fabric, Hyperledger Fabric, Sawtooth Lake, Corda.

Alternative Blockchains: Blockchains - Kadena, Stellar, Rootstock, Quorum, Tezos, Storj, Maidsafe, BigChainDB, Multichain, Tendermint; Platforms - BlockApps, Eris.

UNIT–V: CHALLENGES AND EMERGING TRENDS **(8 Periods)**

Current Challenges: Scalability - Block size increase, block internal reduction, Invertible Blooms lookup tables, Sharding, State channels, Private Blockchain, Proof of stake; Privacy - Indistinguishability obfuscation, Homomorphic encryption, Zero knowledge proofs, State channels, Secure multiparty computation, Usage of hardware to provide confidentiality, Coinjoin, Confidential transactions, MimbleWimble; Security - Smart Contract Security.

Emerging Trends: Emerging trends, Improvement proposals, Blockchain Research - Smart contracts, Centralization issues, Limitations in cryptographic functions, Consensus algorithms, Scalability, Code obfuscation.

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOKS:

1. Imran Bashir, *Mastering Blockchain: Deeper Insights into Decentralization, Cryptography, Bitcoin, and Popular Blockchain Frameworks*, Packt Publishing, 1st Edition, 2017.

REFERENCE BOOKS:

1. ArshdeepBahga, Vijay Madisetti, *Blockchain Applications: A Hands-On Approach*, VPT Books, 2017.
2. Josh Thompson, *Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming*, Create Space Independent Publishing Platform, 2017.

ADDITIONAL LEARNING RESOURCES

1. https://nptel.ac.in/courses/106105184/
2. https://medium.com/moatcoin/part-6-blockchain-simplified-notes-nptel-892f13875555
3. http://www.hands-on-books-series.com/assets/Bahga-Madisetti-Blockchain-Book-Code.zip

III B. Tech.– II Semester
(19BT60505) SOFT COMPUTING

(Professional Elective - 2)
(Common to CSE, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:A Course on "Numerical Methods, Probability and Statistics", "Design and Analysis of Algorithms"

COURSE DESCRIPTION: Soft computing technique concepts,Supervised learning networks, Unsupervised learning networks, Genetic algorithms,Fuzzy logic, Hybrid soft computing techniques and applications.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Investigate soft computing techniques for solving computational problems.
CO2. Design efficient neural architectures to model patterns for a given learning problem.
CO3. Investigate and solve optimization problems using genetic algorithms.
CO4. Apply fuzzy logic and reasoning to handle uncertainty in engineering problems.
CO5. Develop intelligent solutions using hybrid soft computing techniquesto solve problems of multidisciplinary domains.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTIONTO SOFT COMPUTING AND SUPERVISED LEARNING NETWORKS (10 periods)

Introduction to Soft Computing: Neural networks, Application scope of neural networks, Fuzzy logic, Genetic algorithm, Hybrid systems, Softcomputing.

Artificial Neural Networks: Fundamentals, Basic Models, Terminologies, Linear Separability, Hebb network.

Supervised Learning Networks: Perceptron Networks- Theory, Perceptron learning rule, Architecture, Flowchart for training process, Perceptron training algorithm for single and multiple output classes, Perceptron network testing algorithm; Back-Propagation Network - Theory, Architecture, Flow chart for training process, Training algorithm, Learning factors of back-propagation network, Testing algorithm for back-propagation network.

UNIT–II:UNSUPERVISED LEARNING NETWORKS (8 periods)

Fixed weight competitive nets – Maxnet, Mexican Hat Net, Hamming network;Kohonenself-organizing feature maps – Theory, Architecture, Flowchart, Training algorithm; Learning vector quantization – Theory, Architecture, Flowchart, Training algorithm, Variants; Counterpropagation networks – Theory, Full counterpropagation Net, Forward-only counterpropagation Net;Adaptive resonance theory network – Fundamental architecture, Fundamental operating principle, Fundamental algorithm.

UNIT–III:GENETIC ALGORITHMS (9 periods)

Genetic algorithms- Biological background, Traditional optimization and search techniques, Genetic algorithm and search space, Genetic algorithmsvs. traditional algorithms, Basic terminologies in genetic algorithm, Simple GA, General genetic algorithm, Operators in genetic algorithm, Stopping condition for genetic algorithm flow, Constraints in genetic algorithm, Problem solving using genetic algorithm, Adaptive genetic algorithms, Hybrid genetic algorithms, Advantages and limitations of genetic algorithm, Applications of genetic algorithm.

UNIT–IV:FUZZY LOGIC **(11 periods)**

Introduction to fuzzy logic, Classical sets, Fuzzy sets,Membership function – Features, Fuzzification, Methods of membership value assignments; Fuzzy arithmetic and measures–Fuzzyarithmetic, Extension principle, Fuzzy measures, Measures of fuzziness, Fuzzy integrals; Fuzzy rule base and approximation reasoning -Truth values and tables in fuzzy logic, Fuzzy propositions, Formation of rules, Compound rules, Aggregation of fuzzy rules, Fuzzyreasoning, Fuzzy inference systems, Overview of fuzzy expert system; Fuzzy decision making, Fuzzy logic control systems.

UNIT–V:HYBRID SOFT COMPUTING TECHNIQUES AND APPLICATIONS

(7 periods)

Hybrid Soft Computing Techniques: Genetic neuro hybrid systems,Genetic fuzzy hybrid and fuzzy genetic hybrid systems.

Applications of Soft Computing: Optimization of traveling salesman problem using genetic algorithm approach, Genetic algorithm-based internet search technique, Softcomputing-based hybrid fuzzy controllers, Soft computing-based rocket engine control.

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOK(S):

1. S. N. Sivanandam and S. N. Deepa, *Principles of Soft Computing*, Wiley, 3rd Edition, 2019.

REFERENCE BOOKS:

1. S. Rajasekaran and G. A. Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic and Genetic Algorithms:*Synthesis and Applications, PHI Learning Private Ltd, 2011.
2. Udit Chakraborty, Samir Roy, *Soft Computing: Neuro-Fuzzy and Genetic Algorithms,* Pearson, 2013.
3. Saroj Kaushik, Sunita Tewari, *Soft Computing: Fundamentals, Techniques and Applications*, McGraw Hill, 2018.

ADDITIONAL LEARNING RESOURCES:

- https://nptel.ac.in/courses/106105173/

III B. Tech. – I Semester

(19BT51208) IoT ARCHITECTURE AND PROTOCOLS

(Inter Disciplinary Elective-1)
(Common to CSSE & IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

Course Description:
M2M to IoT An Architectural Overview and M2M and IoT Technology Fundamentals, IoT Architecture State of the Art, IoT Reference Architecture and Real-World Design Constraints, IoT Data Link Layer & Network Layer Protocols, Session Layer Protocols and Application Layer Protocols, Security in IoT Protocols and Case studies.

COURSE OUTCOMES: *After successful completion of this course, the students will be able to:*

CO1: Understand the key characteristics of architectural elements of IoT reference model and requirements for designing real world models
CO2: Identifying suitable protocol for the implementation of real world models
CO3: Evaluating security issues and challenges during implementation of real world models

DETAILED SYLLABUS:

Unit I - M2M to IoT an Architectural Overview and M2M and IoT Technology Fundamentals **(09 Periods)**

M2M to IoT an Architectural Overview: Building architecture, Main design principles and needed capabilities, An IoT architecture outline, Standards considerations.

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.

Unit II- IoT Architecture State of the Art, IoT Reference Architecture and Real-World Design Constraints **(09 Periods)**
IoT Architecture State of the Art: Introduction, State of the art, Architecture Reference Model- Reference model and architecture, IoT reference model.

IoT Reference Architecture: Functional view, Information View, Deployment and operational view, Other relevant architectural views

Real-World Design Constraints: Technical design constraints hardware is popular again, Data representation and visualization, Interaction and remote control

Unit III- IoT Data Link Layer & Network Layer Protocols **(09 Periods)**
IoT Data Link Layer: IEEE 802.15.4, IEEE 802.11ah, LoRaWAN, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy

Network Layer Encapsulation Protocols: 6LoWPAN, 6TiSCH, 6Lo
Network Layer Routing Protocols: RPL, CORPL, CARP

Unit IV: Session Layer Protocols and Application Layer Protocols **(09 Periods)**
Session Layer Protocols: MQTT, AMQP, CoAP, XMPP, DDS
Application Layer Protocols: SCADA, Generic Web-Based Protocol

Unit V- Security in IoT Protocols and Case studies **(09 Periods)**

Security in IoT protocols: MAC 802.15.4, 6LoWPAN, RPL, IoT Challenges

Case Studies: Smart Metering, Smart House, Smart Cities

Total Periods: 45

Topics for Self study are provided in the Lesson Plan.

TEXT BOOKS:

1. Jan Holler and Vlasios Tsiatsis, *From Machine-to-Machine to the Internet of Things Introduction to a New Age of Intelligence,* Elsevier Ltd., 2014.
2. David Hanes and Gonzalo Salgueiro, *IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things,* Cisco Press, 2017

REFERENCE BOOKS:

1. Peter Waher, *Learning Internet of Things*, PACKT publishing, BIRMINGHAM –MUMBAI
2. Olivier Hersent and David Boswarthick, *The Internet of Things Key Applications and Protocols*, John Wiley & Sons Ltd Publication, 2012
3. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

III B.Tech. - I Semester

(19BT60402) MICRO CONTROLLERS

(Inter Disciplinary Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PREREQUISITES: Courses on Switching Theory and Logic Design & Linear and Digital IC Applications

COURSE DESCRIPTION:

8051 Microcontroller - Architecture, programming, interrupts and applications; PIC microcontroller architecture, Interrupts and timers of PIC microcontroller, interfacing

COURSE OUTCOMES:

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

CO1 Analyze Architectural features and Instruction Set of 8051 for control applications.

CO2 Analyze PIC18 Architecture and Instruction Set to develop computing applications.

CO3 Develop Programs for PIC18 using ports, timers and associated on Chip resources for Specified Applications.(3,4)

CO4 Design microcomputer based systems with the knowledge of Interfaces and Peripherals of PIC18 to Solve various engineering problems.

DETAILED SYLLABUS:

UNIT I: 80C51/31 **(10 Periods)**

Microprocessors vs Microcontrollers, 8051 Architecture, Internal and external memories, Addressing modes, Timers/Counters structure & configuration, Instruction set of 8051, simple programs using 8051.

UNIT II: PIC ARCHITECTURE & PROGRAMMING **(10 Periods)**

Architecture of PIC18, Register Organization, Memory Organization - ROM space & RAM; Data formats & Directives, Instruction Set: Arithmetic, Logic, branching, Bit wise, bank switching, Simple PIC Programs.

UNIT- III: PORTS, TIMERS & PROGRAMMING **(10 Periods)**

Pin description of PIC18F452, Basic Port Structure, I/O port programming; Macros and modules, Structure of Timer 0 & its Programming using Assembly and C, Counter programming, Structure of timers 1, 2 and 3 & their Programming.

UNIT- IV: PIC - SERIAL PORT AND INTERRUPTS **(7 Periods)**

Basics of communication – Serial/Parallel, RS232 & PIC18 connection to RS232, Serial Port Structure & programming; PIC18 interrupts, Programming timer interrupts, Programming serial interrupts.

UNIT- V: PIC INTERFACING **(8 Periods)**

7 segment LED and LCD interfacing, keyboard interfacing, interfacing ADC, DAC, Interfacing DC motor, stepper motor, PWM using CCP.

Total Periods:45

Topics for self-study are provided in lesson plan.

TEXT BOOKS:

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D, *The 8051 Microcontroller and Embedded Systems-using assembly and C,* PHI, 2006/ Pearson New International Edition 2014
2. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny causey, *PIC Microcontroller and Embedded Systems: Using C and PIC18*, Pearson Education, 2015.

REFERENCE BOOKS:

1. Kenneth J. Ayala, *The 8051 Microcontroller-Architecture, Programming & Applications,* 3rd Edition, Cengage learning, June 2007.
2. Ramesh S. Gaonkar, *Fundamentals of Microcontrollers and Applications in Embedded Systems (With PIC18 Microcontroller Family),* Penram International, 2010.
3. M Rafiquzzaman, *Microcontroller Theory And Applications With The PIC, Wiley India Publications, March 2014*

ADDITIONAL LEARNING RESOURCES:

1. http://crystal.uta.edu/~zaruba/CSE3442/
2. https://owd.tcnj.edu/~hernande/ELC343/
3. http://www.ciebookstore.com/Content/Images/uploaded/PIC18-Study-Guide-CIE.pdf

III B.Tech. – II Semester

(19BT70412) PATTERN RECOGNITION

(Inter Disciplinary Elective-2)
(Common to CSSE & IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A course on Digital Image processing.

COURSE DESCRIPTION:
Importance of pattern recognition; Baye's Decision Theory; Linear and non linear classifiers; Feature selection based on statistical hypothesis testing; Feature Generation; KL Transform; SVD; ICA; Clustering of features and clustering algorithms.

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

CO1. Analyze probability density function between the patterns using bayes classifier for supervised learning.

CO2. Estimate cost function and minimum mean square error between the pattern classes using linear and Non-Linear classifier algorithms such as LMS, Support Vector Machine and back propagation algorithms.

CO3. Apply feature selection and generation techniques to identify features and separate objects in an image.

CO4. Apply clustering techniques to identify various patterns in societal Applications.

DETAILED SYLLABUS

UNIT – I: Introduction to Pattern Recognition **(10 periods)**

Importance of pattern recognition, Features, Feature Vectors and Classifiers, Supervised, Unsupervised and Semi Supervised Learning. Classifiers based on Baye's Decision Theory **-** Baye's decision theory, Discriminant Functions and decision surfaces, Bayesian classification for Normal Distributions, Estimation of Unknown probability density functions, The Nearest Neighbor Rule.

UNIT – II: Linear Classifiers **(9 periods)**

Linear Discriminant functions and Decision Hyperplanes, The perceptron Algorithm, Least Squares Method- Mean Square Error Estimation, Stochastic Approximation and the LMS Algorithm, Sum of Error Squares Estimation Least Squares Method; Mean Square Estimation Revisited- Mean Square Error Regression; Support Vector Machine**-** Separable classes, Nonseparable classes

UNIT – III: Non Linear Classifiers **(9 periods)**

The XOR problem, The two layer perceptron, Three layer perceptrons, The Back propagation Algorithm, The cost function choice, choice of the network size, A simulation example, Networks with weight sharing, generalized linear classifiers, polynomial classifiers, Radial basis Function Networks.

UNIT – IV: Feature Selection & Generation **(9 periods)**

Feature Selection- Pre processing, The peaking phenomenon, Feature selection based on statistical hypothesis testing, ROC curve, class separability measures, feature subset selection; Feature Generation - Basis Vectors and Images, The KL Transform, The Singular Value Decomposition, Independent Component Analysis, Non negative Matrix Factorization, Regional features, Features for shape and size characterization.

UNIT-V: Clustering **(8 periods)**

Introduction, Types of Features, Definitions of Clustering, Proximity Measures-Proximity Measures between Two Points, Proximity Functions between a Point and a Set, Proximity Functions between Two Sets; Categories of Clustering Algorithms, Sequential Clustering Algorithms, A Modification of BSAS, A Two-Threshold Sequential Scheme, Refinement Stages

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

Text Book:

1. Sergios Theodoridis, Konstantinos Koutroumbas, *Pattern Recognition*, Academic Press, Second Edition, 2009.

Reference Books:

1. Richard Duda, Peter E Hart, David G Stork, Pattern Classification, John Wiley & Sons, Second Edition, 2001.
2. Christopher M.Bishop, *Pattern Recognition and Machine Learning,* Springer Publications, 2006.

III B. Tech. - II Semester

(19BT60318) INDUSTRIAL INTERNET OF THINGS

(Inter Disciplinary Elective-2)
(Common to CSE, CSSE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:

COURSE DESCRIPTION:
Introduction to the Industrial Internet; IIoT Reference Architecture; Design of Industrial Internet Systems; Modern Communication Protocols, Wireless Communication Technologies, The Access Network, Access Networks Connecting, Defining Industry 4.0, Introducing the Smart Factory, Smart Factories in Action, IOT – A Market Perspective, Technical Design constraints

COURSE OUTCOMES:
On successful completion of this course, the student will be able to:

CO1: Analyze the functional, informational, and operational characteristics of IoT and IIOT architectures.
CO2: Design industrial internet systems encompassing access network technology and protocols.
CO3: Apply design principles, characteristics, and building blocks of Industry 4.0. for innovative manufacturing applications.
CO4: Demonstrate knowledge of IoT market perspective and Security issues in smart manufacturing.
CO5: Apply real-world design constraints for solving problems encountered in smart manufacturing.

DETAILED SYLLABUS:

UNIT-I: IOT AND IIOT REFERENCE ARCHITECTURE (09 Periods)
Introduction: Introduction to the Internet of Things (IoT). Architecture, Enabling Technologies, Applications.

IIoT Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

UNIT-II: DESIGN OF INDUSTRIAL INTERNET SYSTEMS AND ACCESS NETWORK TECHNOLOGY & PROTOCOLS (09 Periods)
Design of Industrial Internet Systems: The Concept of the IIoT, The Proximity Network, WSNEdge Node, Legacy Industrial Protocols, Modern Communication Protocols, Wireless Communication Technologies, Proximity Network Communication Protocols, Gateways.
Access Network Technology and Protocols: The Access Network, Access Networks Connecting Remote Edge Networks.

UNIT-III: INDUSTRY 4.0 AND SMART FACTORIES (09 Periods)
Industry 4.0: Defining Industry 4.0, Four Main Characteristics of Industry 4.0, The Value Chain, Industry 4.0 Design Principles, Building Blocks of Industry 4.0, Smart Manufacturing.
Smart Factories: Introducing the Smart Factory, Smart Factories in Action, Importance of Smart Manufacturing, Real-World Smart Factories - GE's Brilliant Factory, Airbus: Smart Tools and Smart Apps, Siemens' Amberg Electronics Plant (EWA), Industry 4.0: The Way Forward

220

UNIT-IV: IOT MARKET PERSPECTIVE AND SECURITY ISSUES IN MANUFACTURING **(09 Periods)**

IoT Market perspective: M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, emerging industrial structures for IoT, The international driven global value chain and global information monopolies.

Security issues in Manufacturing: PLCs and DCS, Securing the OT, Network Level: Potential Security Issues, System Level: Potential Security Issues, Identity Access Management

UNIT-V: REAL WORLD IOT DESIGN CONSTRAINTS AND INDUSTRIAL AUTOMATION **(9 Periods)**

Real-World IOT Design Constraints- Introduction, Technical Design constraints-hardware components, Data representation and visualization, Interaction and remote control.

Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things,

Total Periods: 45

Topics for self-study are provided in lesson plan.

TEXT BOOK:

1. Alasdair Gilchrist, *Industry 4.0: The Industrial Internet of Things*, Apress Publications, 2016.
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "*From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*", 1st Edition, Academic Press, 2014.

REFERENCE BOOKS:

1. Giacomo Veneri and Antonio Capasso, *Hands-on Industrial Internet of Things: Createapowerful Industrial IoT infrastructure using Industry 4.0*,Ingram Academic Services, 2018.
2. Vijay Madisetti and ArshdeepBahga, *Internet of Things A Hands-On- Approach*, OrientBlackswan Private Limited, 2015.
3. Francis daCosta, *Rethinking the Internet of Things: A Scalable Approach to Connecting Everything*", 1st edition, Apress Publications, 2014.

III B. Tech. I Semester

(19BT60314) OPTIMIZATION TECHNIQUES

(Inter Disciplinary Elective-1)
(Common to CSE & CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:
A course on Differential equations and Multi variable calculus

COURSE DESCRIPTION:
Introduction to optimization; classical optimization techniques; classification of optimization problems; linear programming; Transshipment and Travelling salesman problem; non-linear programming; un-constrained non-linear programming; constrained non-linear programming; dynamic programming; Genetic Algorithm; Ant Colony Optimization.

COURSE OUTCOMES:
On successful completion of this course, the student will be able to:
CO1. Model and solve unconstrained optimization problems.
CO2. Apply LP Techniques and Conduct Sensitivity analysis for real life Problems
CO3. Apply Non-Linear Programming techniques for real life problems.
CO4. Analyze various complex problems by using Dynamic programming approaches.
CO5. Model and solve complex problems using evolutionary algorithms to optimize the paramenters.

DETAILED SYLLABUS:

UNIT -I: CLASSICAL OPTIMIZATION TECHNIQUES (09 periods)
Introduction, Engineering applications of optimization, Statement of an optimization problem, Design vector, Design constraints, Constraint surface, Objective function, Classification of optimization problems, Single variable optimization, Multi variable optimization without constraints, Multi variable optimization with equality constraints - Lagrange multipliers method; Multi variable optimization with inequality constraint - Kuhn Tucker conditions.

UNIT -II: LINEAR PROGRAMMING (09 periods)
Introduction, Formulation, Primal Simplex method, Dual simplex method, Sensitivity Analysis, Goal programming

UNIT –III: NON-LINEAR PROGRAMMING (09 periods)
One dimensional minimization methods, classification - Fibonacci method, quadratic interpolation method; classification of unconstrained minimization methods - Powell's method, steepest descent method (Cauchy's method); classification of constrained optimization techniques - interior and exterior penalty function methods.

UNIT –IV: DYNAMIC PROGRAMMING (09 periods)
Multistage decision processes, Concept of sub optimization and Principle of optimality, Computational procedure in dynamic programming - Calculus method, Tabular method; Linear Programming problem by dynamic programming approach, Applications - reliability problem, shortest path problem, and capital budgeting problem.

UNIT- V: EVOLUTIONARY OPTIMIZATION ALGORITHMS (09 periods)
Introduction to Evolutionary optimization, genetic algorithm-Mathematical Modeling of Genetic algorithm, Ant Colony Optimization, particle swarm Optimization and differential evolution techniques.

Total Periods:45

Topics for self-study are provided in lesson plan.

TEXT BOOKS:

1. Singiresu S Rao, Engineering Optimization: Theory and Practice, New Age International, 3rdEdition, 2013.
2. A.Ravindran, K.M.Ragsdell, G.V.Reklaitis, Engineering Optimization: Methods and applications, Wiley India Pvt. Ltd., 2nd Edition2006.
3. Dan Simon, Evolutionary Optimization Algorithms, John Wiley & Sons, 2013.

REFERENCE BOOKS:

1. C Mohan and Kusum Deep, Optimization Techniques, New Age International Publishers, 1st Edition, 2010.
2. Hamdy A. Taha, Introduction to Operations Research, PHI, 10th edition, 2017.

III B. Tech. –II Semester
(19BT60531) MACHINE LEARNING LAB
(Common to CSE and CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: Courses on "Programming for Problem Solving", "Machine Learning"

COURSE DESCRIPTION: Implementation of Back propagation algorithm, Decision tree learning, Neural networks, k-NN from scratch algorithm, Naïve Bayes classifier, Radial basis function neural network, SVM based classifier, Maximum likelihood estimation using statistical techniques.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Analyze the given problem and identify appropriate machine learning technique to provide an intelligent solution.
CO2. Design and implement machine learning solutions for classification, regression, and clustering problems.
CO3. Develop intelligent solutions to solve societal problems related to computer vision, information security, healthcare and other areas.
CO4. Work independently to solve problems with effective communication.

LIST OF EXERCISES:

1. Solve classification problem by constructing a feedforward neural network using Backpropagation algorithm. (Wheat Seed Data)
2. Implement ID3 (information gain) algorithm for decision tree learning for transforming continuous variables into discrete variables.
3. Explore the problem of overfitting in decision tree and develop solution using pruning technique.
4. Build a neural network that will read the image of a digit and correctly identify the number.
5. Implement k-NN algorithm to solve classification problem.
6. Use Naïve Bayes classifier to solve the credit card fraud detection problem over a skewed dataset.
7. Design and implement a radial basis function neural network to solve function approximation or regression problem.
8. Compare and analyze the performance of optimal Bayes classifier and Naïve Bayes using simulated Gaussian Data.
9. Train an SVM based classifier to predict whether the cancer is malignant or benign.
10. Solve the stock price forecasting problem using statistical techniques – Maximum Likelihood estimation after understanding the distribution of the data.

REFERENCE BOOKS:

1. Sebastian Raschka, Vahid Mirjalili, *Python Machine Learning*, Packt Publishing, 3rdEdition, 2019.
2. AurelienGeron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems*, 2ndEdition, O'Reilly, 2019.

Software/Tools used:

- Python
- Scikit-learn/Keras/TensorFlow

ADDITIONAL LEARNING RESOURCES: 228

- https://www.coursera.org/learn/machine-learning
- https://nptel.ac.in/courses/106106202/