

GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR
SEMESTER SCHEME-2020-21



III SEMESTER
(SESSION 2021-2022 & ONWARDS)

COMPUTER PROGRAMMING

Course Code	:	CS 3001(Same as CB/CI/IT 3001)
Course Title	:	Computer Programming
Number of Credits	:	4 (L: 4; T: 0; P: 0)
Prerequisites	:	-
Course Category	:	PC

COURSE OBJECTIVES

To enable student, develop structured solutions to problems and implementing them using computers. This involves two parts: i)Formulating a solution for a given problem as a well-defined sequence of actions, and ii) Expressing solution in a machine-readable form or a programming language. For the second part, we will learn the common units of programming languages. The first part can only be learned through the repeated practice of solving problems.

COURSE OUTCOMES

Student should be able to computationally formulate basic problems and write code snippets to execute them. The focus of the course as mentioned above should be on example-based learning. The basic nitty gritty can be skipped, however, the application part should be clear. For instance, when to use an array, when to use loop and when to use conditional statements.

COURSE CONTENTS

The language of choice will be C. The focus will be on problem solving and problem where these ideas can be applied. The main focus of the class will to take examples of problems where these ideas can be employed.

1. Introduction to Problem Solving

- 1.1. Computational way of thinking
- 1.2. Variables
- 1.3. Representation

2. Operators and Formatting

- 2.1. Introduction to Operators
 - 2.1.1. Arithmetic Operators
 - 2.1.2. Relational Operators
 - 2.1.3. Logical and Bitwise Operators
- 2.2. Input, Output, Formatting and File I/O

3. Control Statements

- 3.1. Conditional Statements
- 3.2. Repeat Statements
 - 3.2.1. Loops
 - 3.2.2. Nested Loops

4. Arrays

- 4.1. Arrays and Memory Organization
- 4.2. Strings
- 4.3. Multidimensional Arrays
- 4.4. Functions and Parameter Passing

5. Recursion

- 5.1. Introduction to Recursion
- 5.2. Recursive solutions

REFERENCE BOOKS:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.
7. Outline of Programming with C, Byron Gottfried, Schaum, McGraw-Hill

SCRIPTING LANGUAGE (PYTHON)

Course Code	:	CS 3002
Course Title	:	Scripting Languages (Python)
Number of Credits	:	4(L: 4, T: 0, P:0)
Prerequisites	:	-
Course Category	:	PC

COURSE OBJECTIVES

To learn how to work with a scripting language.

COURSE OUTCOMES

At the end of the course student will be able to build program with a scripting language and will be able to learn any other scripting language on their own.

COURSE CONTENTS**UNIT 1: Introduction, Variables and Data Types**

- 1.1 History
- 1.2 Features
- 1.3 Setting up path
- 1.4 Installation and Working with Python/Perl
- 1.5 Basic Syntax
- 1.6 Understanding Python variables
- 1.7 Numeric data types
- 1.8 Using string data type and string operations
- 1.9 Basic Operators
- 1.10 Understanding coding blocks
- 1.11 Defining list and list slicing
- 1.12 Other Data Types (Tuples, List, Dictionary -Python, Arrays, Associative Arrays)

UNIT 2: Control Structures

- 2.1 Conditional blocks using if
- 2.2 else and elif
- 2.3 For loops and iterations
- 2.4 while loops
- 2.5 Loop manipulation using continue, break and pass
- 2.6 Programming using conditional and loops block

UNIT 3: Functions, Modules and Packages

- 3.1 Organizing codes using functions
- 3.2 Organizing projects into modules
- 3.3 Importing own module as well as external modules
- 3.4 Understanding Packages

UNIT 4: File I/O, Text Processing, Regular Expressions

- 4.1 Understanding read functions
- 4.2 Understanding write functions
- 4.3 Programming using file operations
- 4.4 Powerful pattern matching and searching
- 4.5 Power of pattern searching using regex

UNIT 5: Frameworks

- 5.1 Overview of Django
- 5.2 Django Design Philosophy
- 5.3 Creating a simple Django Project
- 5.4 Django App life cycle

REFERENCE BOOKS:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.
6. Beginning Python using Python 2.6 and Python 3, James Payne, Wrox publishing

7. Practical Programming: An Introduction to Computer Science using Python3, Paul Gries, The Pragmatic Bookshelf

SEMESTER SCHEME-2020-21

DATA STRUCTURES

Course Code	:	CS 3003(Same as CB/CI/IT 3003)
Course Title	:	Data Structures
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	-
Course Category	:	PC

COURSE OBJECTIVES

To provide strong foundation for implementing programming language to formulate, analyze and develop solutions related to various data structures problems.

COURSE OUTCOMES

Have a good understanding of Data Structures and its applications in algorithms.

COURSE CONTENTS**1. Introduction to Data Structures**

- 1.1. Basic Terminology
- 1.2. Classification of Data Structures
- 1.3. Operations on Data Structures.

2. Linear Data Structures

- 2.1. Stacks
 - 2.1.1. Introduction to Stacks
 - 2.1.2. Array Representation of Stacks
 - 2.1.3. Operations on a Stack
 - 2.1.4. Applications of Stacks
 - 2.1.4.1. Infix-to-Postfix Transformation
 - 2.1.4.2. Evaluating Postfix Expressions.
- 2.2. Queues
 - 2.2.1. Introduction to Queues
 - 2.2.2. Array Representation of Queues
 - 2.2.3. Operations on a Queue
 - 2.2.4. Types of Queues
 - 2.2.4.1. DeQueue
 - 2.2.4.2. Circular Queue
 - 2.2.5. Applications of Queues-Round Robin Algorithm.

3. Linked Lists

- 3.1. Introduction to Linked List
 - 3.1.1. Singly Linked List
 - 3.1.1.1. Representation in Memory
 - 3.1.1.2. Operations on a Single Linked List
- 3.2. Circular Linked Lists
- 3.3. Doubly Linked Lists
- 3.4. Linked List Representation and Operations of Stack
- 3.5. Linked List Representation and Operations of Queue.

4. Non Linear Data Structures

- 4.1. TREES
 - 4.1.1. Basic Terminologies
 - 4.1.2. Definition and Concepts of Binary Trees
 - 4.1.3. Representations of a Binary Tree using Arrays and Linked Lists
 - 4.1.4. Operations on a Binary Tree
 - 4.1.4.1. Insertion
 - 4.1.4.2. Deletion
 - 4.1.4.3. Traversals
 - 4.1.5. Types of Binary Trees.
- 4.2. GRAPHS
 - 4.2.1. Graph Terminologies
 - 4.2.2. Representation of Graphs
 - 4.2.2.1. Set
 - 4.2.2.2. Linked
 - 4.2.2.3. Matrix

4.2.3. Graph Traversals

REFERENCE BOOKS:

1. Data Structures, R.S. Salaria, Khanna Book Publishing, NewDelhi
2. Data Structures Using C, ReemaThareja, Oxford University Press India.
3. Classic Data Structures, SamantaDebasis, Prentice Hall ofIndia.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
5. Data Structures: A Pseudo code approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
6. Data Structures and Algorithms: Concepts, Techniques and Applications, G.A.V.Pai, McGraw- Hill Education, India.

SEMESTER SCHEME-2020-21

COMPUTER SYSTEM ORGANISATION

Course Code	:	CS 3004 (Same as CB/CI 3003)
Course Title	:	Computer System Organisation
Number of Credits	:	4(L: 3, T: 1, P: 0)
Prerequisites	:	-
Course Category	:	PC

COURSE OBJECTIVES

To have a thorough understanding of the basic structure and operation of a digital computer, its architectures and computational designs.

COURSE OUTCOMES

Have a good understanding of functioning of computer system as such and its various sub components. Student will be able to understand and computing requirement for a specific purpose, analyse performance bottlenecks of the computing device and choose appropriate computing device for a given usecase.

COURSE CONTENTS**1. Structure of Computers**

- 1.1. Computer Functional units
- 1.2. Von-Neumann architecture
- 1.3. Bus structures
- 1.4. Basic Operational Concepts
- 1.5. Data representation (Fixed and Floating point)
- 1.6. Error detecting codes.
- 1.7. Register Transfer and Micro Operations
 - 1.7.1. Register transfer
 - 1.7.2. Bus and memory transfers
 - 1.7.3. Arithmetic micro-operations
 - 1.7.4. Logic micro-operations
 - 1.7.5. Shift micro-operations
 - 1.7.6. Arithmetic logic shift unit.

2. Micro Programmed Control

- 2.1. Control memory
- 2.2. Address sequencing
- 2.3. Design of control unit
- 2.4. Computer Arithmetic
 - 2.4.1. Addition and Subtraction
 - 2.4.2. Multiplication and Division algorithms
 - 2.4.3. Floating-point arithmetic operation
 - 2.4.4. Arithmetic Pipeline
 - 2.4.5. Instruction Pipeline
 - 2.4.6. RISC Pipeline
 - 2.4.7. Vector Processing
 - 2.4.8. Array Processors.

3. Introduction to Microprocessor Architecture

- 3.1. Instruction Set Architecture design principles from programmer's perspective.
- 3.2. One example microprocessor (Intel, ARM, etc).

4. Assembly Language Programming

- 4.1. Simple programs
- 4.2. Assembly language programs involving
 - 4.2.1. logical
 - 4.2.2. branch
 - 4.2.3. call instructions
 - 4.2.4. sorting
 - 4.2.5. evaluation of arithmetic expressions

- 4.2.6. string manipulation
- 4.2.7. assembler directives
- 4.2.8. procedures and macros.

5. Memory and Digital Interfacing

- 5.1. addressing and address decoding
- 5.2. Interfacing of:
 - 5.2.1. RAM
 - 5.2.2. ROM
 - 5.2.3. EPROM

REFERENCE BOOKS:

1. Computer System Architecture, M. Moris Mano, Pearson/PHI India.
2. Microprocessors Interface, Douglas V.Hall, Tata McGraw-Hill.
3. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, McGraw-Hill
4. Advanced Microprocessors and Peripherals- Architecture, Programming and interfacing, A.K.Ray, K.M. Bhurchandi, Tata McGraw-Hill, New Delhi, India.
5. Computer Organization and Design: A Hardwar/Software Interface (MIPS Edition) by Patterson and Hennessy.

ALGORITHMS

Course Code	CS 3005(Same as IT 3005)
Course Title	Algorithms
Number of Credits	4(L: 3, T: 1, P: 0)
Prerequisites	-
Course Category	PC

COURSE OBJECTIVES

The objective of this course is to prepare the student with the algorithmic foundations of computing. A sound grasp of algorithms is essential for any computer science engineer. Almost all programming involves algorithms at some level.

COURSE OUTCOMES

The student should be able to design basic algorithms for sorting and searching. The student should be able to understand the basic notions of time and space complexity of algorithms. The student should be able to implement sorting, searching, tree and graph algorithms in a modern computer programming language.

COURSE CONTENTS**1. Fundamentals**

- 1.1. Programming Models
- 1.2. Data Abstraction
 - 1.2.1. Sets
 - 1.2.2. Multisets
 - 1.2.3. Stacks
 - 1.2.4. Queues
- 1.3. Asymptotic and worst-case analysis of algorithms.

2. Sorting

- 2.1. The sorting problem
- 2.2. Bubble sort
- 2.3. Selection sort
- 2.4. Insertion sort
- 2.5. Merge sort
- 2.6. Quicksort.

3. Searching

- 3.1. Symbol Tables
- 3.2. Binary Search Trees
- 3.3. Balanced Search Trees
- 3.4. Hash Tables.

4. Graphs

- 4.1. Definition of a directed and undirected graph
 - 4.1.1. Paths
 - 4.1.2. Cycles
 - 4.1.3. Spanning trees
- 4.2. Directed Acyclic Graphs
- 4.3. Topological Sorting
- 4.4. Minimum Spanning Tree algorithms
 - 4.4.1. Shortest Path algorithms: Dijkstra's algorithm
 - 4.4.2. Flow-based algorithms.

5. Strings

- 5.1. String Sort
- 5.2. Tries
- 5.3. Substring Search
- 5.4. Regular Expressions
- 5.5. Elementary Data compression.

REFERENCE BOOKS:

1. Algorithms, Sedgewick and Wayne, Pearson
2. Introduction to Algorithms, Cormen, Leiserson, Rivest and Stein. MIT Press
3. Introduction to Theory of Computation, Sipser Michael, Cengage Learning.

4. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House

SEMESTER SCHEME-2020-21

COMPUTER PROGRAMMING LAB

Course Code	CS 3006(Same as CB/CI/IT 3006)
Course Title	Computer Programming Lab
Number of Credits	2(L: 0, T: 0, P: 4)
Prerequisites	-
Course Category	PC

COURSE OBJECTIVES

This Lab course is intended to practice what is taught in theory class of 'Computer Programming' and become proficient in computer programming. Computer programming is all about regular practice. Students should work on solved and unsolved problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listed below.

COURSE OUTCOMES

Student should be able to write code snippets, and then compile, debug and execute them.

COURSE CONTENTS

S.No.	Topics for Practice
1	Familiarization with programming environment (Editor, Compiler, etc.)
2	Programs using I/O statements and various operators
3	Programs using expression evaluation and precedence
4	Programs using decision making statements and branching statements
5	Programs using loop statements
6	Programs to demonstrate applications of n dimensional arrays
7	Programs to demonstrate use of string manipulation functions
8	Programs to demonstrate parameter passing mechanism
9	Programs to demonstrate recursion
10	Programs to demonstrate use of pointers
11	Programs to demonstrate command line arguments
12	Programs to demonstrate dynamic memory allocation
13	Programs to demonstrate file operations

The language of choice will be C. This is a skill course. More you practice, better it will be.

REFERENCE BOOKS:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.

SCRIPTING LANGUAGE (Python) LAB

Course Code	CS 3007
Course Title	Scripting Language (Python)Lab
Number of Credits	2(L: 0, T: 0, P: 4)
Prerequisites	-
Course Category	PC

COURSE OBJECTIVES

This Lab course is intended to practice whatever is taught in theory class of 'Scripting Languages' and become proficient in scripting. Computer programming is all about regular practice. Students should work on solved and unsolved problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listed below.

COURSE OUTCOMES

At the end of the course student will be able to build program with a scripting language and will be able to learn any other scripting language on their own.

COURSE CONTENTS

S.No.	Topics for Practice
1	Practice basic coding syntax
2	Write and execute scripts based on data types
3	Write and execute Python scripts with conditionals and loops
4	Write and execute Scripts based on Functions and Modules
5	File Processing scripts
6	Write and execute Regular Expressions
7	Write and execute SQL Queries

Lecturer may choose any one scripting language. This is a skill course. More student practice and try to find solution on their own, better it will be.

REFERENCE BOOKS:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University Press
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.
6. Beginning Python using Python 2.6 and Python 3, James Payne, Wrox publishing
7. Practical Programming: An Introduction to Computer Science using Python3, Paul Gries, The Pragmatic Bookshelf

DATA STRUCTURES LAB

Course Code	CS 3008(Same as CB/CI/IT 3008)
Course Title	Data Structures Lab
Number of Credits	1(L: 0, T: 0, P: 2)
Prerequisites	-
Course Category	PC

COURSE OBJECTIVES

This Lab course is intended to practice whatever is taught in theory class of 'Data Structures', 'Algorithms' and is an extension of previous course on 'Computer Programming'. Students should work on problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listed below. This Lab course requires a good coordination between theory course in Data Structures and Algorithms.

COURSE OUTCOMES

Student will be able to write programs for creating and doing different operations on various data structures. Student will be able to use/implement various algorithms learnt in the course on Algorithms. In summary student will have a good command over Data Structures and its applications in Algorithms.

COURSE CONTENTS

S.No.	Topics for Practice
1	Write a program using recursive and non-recursive functions to perform search operation in a given list of integers using linear search technique
2	Search operation in a given list of integers using binary search technique
3	Write a program to implement insertion sorting for a given random data
4	Write a program to implement bubble sorting for a given random data
5	Write a program to implement quick sorting for a given random data
6	Write a program to implement selection sorting for a given random data
7	Write a program to implement heap sorting for a given random data
8	Write a program to implement single linked list
9	Write a program to implement double linked list
10	Write a program to implement circular linked list
11	Write a program to Implement Stack operations using array and linked list
12	Write a program to Implement Queue operations using array and linked list.
13	Write a program to implement Breadth First Search (BFS)
14	Write a program to implement Depth First Search (DFS)
15	Write a program to implement a binary tree of integers

Use 'C' as programming language for the purpose. This is a skill course. More student practice and try to find solution on their own, better it will be.

REFERENCE BOOKS:

1. Data Structures, R.S. Salaria, Khanna Book Publishing
2. Data Structures Using C, Reema Thareja, Oxford University Press India.
3. Classic Data Structures, Samanta Debasis, Prentice Hall of India.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
5. Data Structures: A Pseudo code approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
6. Data Structures and Algorithms: Concepts, Techniques and Applications, G.A.V. Pai, McGraw- Hill Education, India.

GOVERNMENT OF RAJASTHAN
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SEMESTER SCHEME-2020-21



IV SEMESTER
(SESSION 2021-2022 & ONWARDS)

OPERATING SYSTEMS

Course Code	CS 4001(Same as CB/IT 4001)
Course Title	Operating Systems
Number of Credits	3 (L: 3, T: 0, P :0)
Pre-requisites	CS 3003 Data Structure
Course Category	PC

COURSE LEARNING OBJECTIVES:

A general introduction to various ideas in implementation of operating systems, particularly UNIX. Introduce to various options available so as to develop capacity to compare, contrast, and evaluate the key trade-offs between different design choices.

UNIT 1:

- 1.1. Overview of Operating System
- 1.2. Basic concepts
- 1.3. UNIX/LINUX Architecture
- 1.4. Kernel
- 1.5. Services and systems calls
- 1.6. System programs.

UNIT 2:

- 2.1. Process management
 - 2.1.1. Process concepts,
 - 2.1.2. Operations on processes
 - 2.1.3. Ipc
- 2.2. Process scheduling:
 - 2.2.1. FCFS
 - 2.2.2. SJF
 - 2.2.3. Priority
 - 2.2.4. Round Robin
- 2.3. Multi- threaded programming
- 2.4. Memory management
 - 2.4.1. Memory allocation
 - 2.4.2. Swapping
 - 2.4.3. Paging
 - 2.4.4. Segmentation
- 2.5. Virtual memory

UNIT 3:

- 3.1. File management
 - 3.1.1. Concept of a file
 - 3.1.2. Access methods
- 3.2. Directory structure
- 3.3. File system structure and implementation
 - 3.3.1. Directory implementation
 - 3.3.2. Free- space management
 - 3.3.3. Efficiency and performance.
- 3.4. Different types of file systems

UNIT 4:

- 4.1. I/o system
- 4.2. Mass storage structure
 - 4.2.1. Overview
 - 4.2.2. Disk structure
 - 4.2.3. Disk attachment
- 4.3. Disk scheduling algorithms
 - 4.3.1. FCFS

- 4.3.2. SSTF
- 4.3.3. SCAN
- 4.3.4. LOOK
- 4.4. Swap space management
- 4.5. Raid.

UNIT 5:

- 5.1. OS Security
- 5.2. Authentication
- 5.3. Access Control
- 5.4. Access Rights
- 5.5. System Logs

REFERENCE BOOKS:

1. Operating System Concepts, Silberschatz and Galvin, Wiley India Limited
2. UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education
3. Operating Systems, Internals and Design Principles, Stallings, Pearson Education, India
4. Operating System Concepts, Ekta Walia, Khanna Publishing House
5. Modern Operating Systems, Andrew S. Tanenbaum, Prentice Hall of India
6. Operating systems, Deitel & Deitel, Pearson Education, India

COURSE OUTCOMES:

Students should be able to demonstrate basic knowledge about Operating System, be able to apply OS concepts such as processes, memory and file systems to system design, able to configure OS in an efficient and secure manner.

INTRODUCTION TO DBMS

Course Code	CS 4002(Same as CI/IT 4002)
Course Title	Introduction to DBMS
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	CS 3002 Scripting Language
Course Category	PC

COURSE LEARNING OBJECTIVES:

It covers the development of database-driven applications using the capabilities provided by modern database management system software. The concepts include conceptual modeling, relational database design and database query languages.

COURSE OUTCOMES:

After completing the course, the students will understand

- (i) How to design a database, database-based applications
- (ii) How to use a DBMS
- (iii) The critical role of database system in designing several information system-based software systems or applications.

COURSE CONTENT:

As a part of the lab, project work is included.

UNIT 1:

- 1.1. Introduction
- 1.2. Components of DBMS
- 1.3. Advantage of DBMS
- 1.4. Database System v/s File System
- 1.5. Database System Concepts and Architecture
- 1.6. Application Architecture of DBMS
- 1.7. Overall Database Structure

UNIT 2 :

- 2.1. Data Modeling using the Entity-Relationship Model
- 2.2. Notations of ER Diagram
- 2.3. Mapping Constraints
- 2.4. Keys
- 2.5. The Enhanced Entity-Relationship (EER) model

UNIT 3:

- 3.1. The Relational Data Model and Relational Database Constraints
- 3.2. Codd's Rule of DBMS
- 3.3. ER/EER to Relational Model mapping
- 3.4. Relational Algebra
- 3.5. Relational Calculus

UNIT 4:

- 4.1. SQL-99
 - 4.1.1. Schema definition,
 - 4.1.2. Constraints
 - 4.1.3. Queries and Views
- 4.2. Security
- 4.3. Introduction to SQL programming Techniques

UNIT 5:

- 5.1. Functional dependencies and normalization for relational databases
 - 5.1.1. Normalization Concepts
 - 5.1.2. Normal Forms (1NF, 2NF, 3NF, BCNF)
- 5.2. Relational database design algorithms and further dependencies.

- 5.2.1. Multi-Valued Dependency and 4NF
- 5.2.2. Join Dependency and 5NF

REFERENCE BOOKS:

1. Fundamentals of Database Systems, Elmasri & Navathe, Pearson Education
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, TataMcGraw-Hill.
3. Database System Concepts, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw- Hill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, Rick F.Vander Lans, Pearson Education

SEMESTER SCHEME-2020-21

COMPUTER NETWORKS

Course Code	CS 4003(Same as CB/CI/IT 4003)
Course Title	Computer Networks
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	-
Course Category	PC

COURSE LEARNING OBJECTIVES:

Understand functioning of computer networks and popular networking protocols

COURSE OUTCOMES:

1. Understanding of computer networks, issues, limitations, options available.
2. Understanding of the care that needs to be taken while developing applications designed to work over computer networks
3. Able to configure basic LAN and connect computers to it.

COURSE CONTENT:**UNIT 1:**

- 1.1. Introduction to computer networks
- 1.2. Network Models
- 1.3. OSI Reference Model
- 1.4. TCP/IP Model

UNIT 2:

- 2.1. Transmission media
 - 2.1.1. Principles
 - 2.1.2. Issues and examples
- 2.2. Wired media – coaxial, utp, stp, fiber optic cables
- 2.3. Wireless media – hf, vhf, uhf, microwave, ku band
- 2.4. Network topologies
- 2.5. Data link layer
 - 2.5.1. Design issues
 - 2.5.2. Example protocols (ethernet, wlan, bluetooth)
 - 2.5.3. Switching techniques

UNIT 3:

- 3.1. Network layer
 - 3.1.1. Design issues
 - 3.1.2. Example protocols (ipv4)
- 3.2. Routing
 - 3.2.1. Principles/issues,
 - 3.2.2. Algorithms (distance-vector, link-state) and protocols (rip, ospf)

UNIT 4:

- 4.1. Transport layer
 - 4.1.1. Design issues,
 - 4.1.2. Example protocols (tcp)
- 4.2. Application layer protocols (smtp, dns).

UNIT 5:

- 5.1. Functioning of Network Devices
 - 5.1.1. NIC, Hub, Switch, Router, WiFi Devices
- 5.2. Network Management System and example protocol (SNMP).

REFERENCE BOOKS:

1. Computer Networks, 4th Edition (or later), Andrew S. Tanenbaum, PHI
2. TCP/IP Illustrated, Volume-1, W. Richard Stevens, Addison Wesley

3. Data and Computer Communications, William Stallings, PHI
4. An Engineering Approach to Computer Networking, S. Keshav, Addison Wesley/Pearson
5. An Integrated Approach to Computer Networks, Bhavneet Sidhu, Khanna Publishing House

SEMESTER SCHEME-2020-21

SSAD/SOFTWARE ENGINEERING

Course Code	CS 4004(Same as IT 4004)
Course Title	SSAD/Software Engineering
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	-
Course Category	PC

COURSE LEARNING OBJECTIVES:

1. Inculcate essential technology and software engineering knowledge and skills essential to build a reasonably complex usable and maintainable software iteratively.
2. Emphasize on structured approach to handle software development.
3. Enhance communication skills.

COURSE OUTCOMES:

The proposed course is expected to provide an introduction to software engineering concepts and techniques to undergraduate students, thus enabling them to work in a small team to deliver a software system. The course content and project will introduce various software technologies, process and project management skills that are needed for the delivery of software in a team setting

COURSE CONTENTS:

As per the course design, concepts learned as part of this course will/should be used in the Minor Project (Proj.202). These two courses should go hand in hand to be effective.

UNIT 1:

- 1.1. Introduction to Software Engineering
- 1.2. Lifecycle
- 1.3. Process Models
- 1.4. Traditional v/s Agile processes

UNIT 2:

- 2.1. Development Activities
 - 2.1.1. Requirements Gathering and Analysis
- 2.2. Design Concepts
 - 2.2.1. Software architecture and Architectural styles
 - 2.2.2. Basic UI design
- 2.3. Effective Coding and Debugging techniques

UNIT 3:

- 3.1. Software Testing Basics
 - 3.1.1. Unit, Integration, System and Acceptance Testing
- 3.2. Introduction to various testing techniques (e.g. Stress testing)
- 3.3. Writing and executing test cases
- 3.4. Quality Assurance

UNIT 4:

- 4.1. Project Management
 - 4.1.1. Project management concepts,
 - 4.1.2. Configuration and Release Management
 - 4.1.3. Version Control and its tools (Git)
- 4.2. Release Planning
- 4.3. Change Management
- 4.4. Software Maintenance

REFERENCE BOOKS:

1. Software Engineering – A Practitioner's Approach, 7th Edition, Roger Pressman.
2. Software engineering, Ian Sommerville, Pearson Education
3. An Integrated Approach to Software Engineering, Pankaj Jalote, Springer Verlag
4. Software Engineering, Nasib Singh Gill, Khanna Book Publishing Co. India.
5. Software Engineering, K. K. Agarwal, Yogesh Singh, New Age International Publishers

WEB TECHNOLOGIES

Course Code	CS 4005(Same as CB/CI 4005)
Course Title	Web Technologies
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	-
Course Category	PC

COURSE LEARNING OBJECTIVES:

To provide basic skills on tools, languages and technologies related to website development. Learnings from this course may be used in the Mini Project and summer internship.

COURSE OUTCOMES:

Student will be able to develop/build a functional website with full features.

COURSE CONTENTS:**UNIT 1: INTRODUCTION TO WWW**

- 1.1. Protocols and programs
 - 1.1.1. Secure connections,
 - 1.1.2. Application and development tools
- 1.2. The web browser
- 1.3. What is server
- 1.4. Setting up UNIX and LINUX web servers
- 1.5. Logging users
- 1.6. Dynamic IP Web Design
 - 1.6.1. Web site design principles
 - 1.6.2. Planning the site and navigation

UNIT 2: WEB SYSTEMS ARCHITECTURE

- 2.1. Architecture of Web based systems
 - 2.1.1. Client/server (2-tier) architecture
 - 2.1.2. 3-Tier architecture
- 2.2. Building blocks of fast and scalable data access Concepts
 - 2.2.1. Caches-Proxies- Indexes-Load Balancers- Queues
- 2.3. Web Application architecture (WAA)

UNIT 3: JAVASCRIPT

- 3.1. Client side scripting
- 3.2. What is Javascript
- 3.3. Simple Javascript
- 3.4. Variables
- 3.5. Functions, conditions
- 3.6. Loops and repetition

UNIT 4: ADVANCE SCRIPTING

- 4.1. Javascript and objects
 - 4.1.1. Javascript own objects
 - 4.1.2. DOM and web browser environments, forms and validations
- 4.2. DHTML
 - 4.2.1. Combining HTML, CSS and Javascript
- 4.3. Ajax
- 4.4. Introduction to XML
- 4.5. Introduction to Web Services

UNIT 5: PHP

5.
 - 5.1. Server side scripting
 - 5.1.1. Arrays
 - 5.1.2. Function and forms

- 5.1.3. Advance php
- 5.2. Databases
 - 5.2.1. Basic command with php examples
 - 5.2.2. Connection to server, creating database
 - 5.2.3. Selecting a database
 - 5.2.4. Listing database
 - 5.2.5. Listing table- names creating a table
 - 5.2.6. Inserting data
 - 5.2.7. Altering tables, queries, deleting database, deleting data and tables
- 5.3. Php myadmin and database bugs

REFERENCE BOOKS:

1. "Web Technologies--A Computer Science Perspective", Jeffrey C.Jackson,
2. "Internet & World Wide Web How To Program", Deitel, Deitel, Goldberg, Pearson Education
3. "Web programming- Building Internet Application", Chris Bales
4. Web Applications: Concepts and Real World Design, Knuckles.

SEMESTER SCHEME-2020-21

INFORMATION SECURITY

Course Code	CS 40061 (Same as IT 40061)
Course Title	Information Security
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	--
Course Category	PE

COURSE LEARNING OBJECTIVES:

To learn how to evaluate and enhance information security of IT infrastructure and organisations

COURSE OUTCOMES:

Understanding of security needs and issues of IT infrastructure. Have basic skills on security audit of networks, operating systems and application software.

COURSE CONTENTS:**UNIT 1:**

- 1.1. Introduction to Information Security
- 1.2. Various aspects of information security (PAIN)
- 1.3. Security Features of Operating Systems
 - 1.3.1. Authentication
 - 1.3.2. Logs
 - 1.3.3. Audit Features
 - 1.3.4. File System Protection,
 - 1.3.5. User Privileges
 - 1.3.6. RAID options
 - 1.3.7. Anti-Virus Software, etc.

UNIT 2:

- 2.1. Understanding security weaknesses in popular networking protocols
 - 2.1.1. IP
 - 2.1.2. TCP
 - 2.1.3. UDP
 - 2.1.4. RIP
 - 2.1.5. OSPF
 - 2.1.6. HTTP
 - 2.1.7. SMTP etc.
- 2.2. Security weaknesses in common networking devices
 - 2.2.1. Hub
 - 2.2.2. Switch
 - 2.2.3. Router
 - 2.2.4. Wifi
- 2.3. Security solutions to mitigate security risk of
 - 2.3.1. Networking protocols (ipsec, HTTPS, etc)
 - 2.3.2. Devices (VLAN, VPN, Ingress Filtering, etc)

UNIT 3:

- 3.1. Basics of Cryptography
- 3.2. PKI
- 3.3. Security considerations while developing softwares

UNIT 4:

- 4.1. Network Security Products
- 4.2. Firewall
- 4.3. IDS/IPS
- 4.4. VPN Concentrator
- 4.5. Content Screening Gateways, etc.

UNIT 5:

- 5.1. Introduction to Security Standards
- 5.2. ISO 27001
- 5.3. Indian IT Act
- 5.4. IPR Laws
- 5.5. Security Audit procedures
- 5.6. Developing Security Policies
- 5.7. Disaster Recovery, Business Continuity Planning

REFERENCE BOOKS:

1. Information Security and Cyber Laws, Sarika Gupta, Khanna Publishing House
2. RFCs of protocols listed in content (<https://www.ietf.org>)
3. Various Acts, Laws and Standards (IT Act, ISO27001 Standard, IPR and Copyright Laws, etc.)
4. Security Guideline documents of Operating Systems (OS Manual, Man Pages, etc)
5. <https://www.cert-in.org.in/>
6. <https://www.sans.org/>

SEMESTER SCHEME-2020-21

NETWORK FORENSICS

Course Code	CS 40062
Course Title	Network Forensics
Number of Credits	4(L: 3, T: 1, P: 0)
Prerequisites	CS 4001 Operating Systems, CS 4003 Computer Networks
Course Category	PE

COURSE LEARNING OBJECTIVES:

To understand various network forensic aspects for analysing network security breach

COURSE OUTCOMES:

Student will understand basic concepts of network forensics, learn tools, and will be able to do basic forensic investigations and handle security incidents.

COURSE CONTENTS:**UNIT 1:**

- 1.1. Review of Networking concepts and Protocols
- 1.2. Introduction to Network Forensics
- 1.3. Various aspects of Network Forensics

UNIT 2:

- 2.1. Introduction to Network Forensic Tools and techniques
- 2.2. Wireshark
- 2.3. TCP Dump
- 2.4. Syslog
- 2.5. NMS
- 2.6. Promiscuous Mode
- 2.7. Network Port Mirroring
- 2.8. Snooping
- 2.9. Scanning tools, etc.

UNIT 3:

- 3.1. Understanding and Examining Data Link Layer
 - 3.1.1. Physical Layer
 - 3.1.2. Ethernet Switch Logs
 - 3.1.3. MAC Table
 - 3.1.4. ARP Table, etc.
- 3.2. Understanding and Examining Network Layer
 - 3.2.1. Router Logs
 - 3.2.2. WiFi Device logs
 - 3.2.3. Firewall logs,

UNIT 4:

- 4.1. Understanding audit features of OS and applications
- 4.2. Enabling and Examining Server logs
- 4.3. User activity logs
- 4.4. Browser history analysis
- 4.5. Proxy server logs
- 4.6. Antivirus logs
- 4.7. Email logs

UNIT 5:

- 5.1. Limitations and challenges of network forensics due to
 - 5.1.1. Encryption
 - 5.1.2. Spoofing
 - 5.1.3. Mobility
 - 5.1.4. Storage limitations

5.1.5. Privacy laws, etc.

SUGGESTED LAB WORK:

This is a skill course. Topics/tools taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should explore features of various tools/applications introduced during the course. Teacher should give weekly tasks as assignment.

REFERENCE BOOKS:

1. Manuals of OS, application software, network devices
2. RFCs of various networking protocols (<https://www.ietf.org/>)
3. <https://www.sans.org/>
4. <https://www.cert-in.org.in/>
5. Handbook of Digital Forensics and Investigation, Eoghan Casey, Elsevier Academic Press
6. Cyber Forensics, Albert Marcella and Doug Menendez, CRC Press
7. Computer Forensics (5 volume Set) mapping to CHFI (Certified Hacking Forensics Investigator), by EC-Council

SEMESTER SCHEME-2020-21

OPERATING SYSTEMS LAB

Course Code	CS 4007 (Same as CI/IT 4007)
Course Title	Operating Systems Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	CS 3003 Data Structures
Course Category	PC

COURSE LEARNING OBJECTIVES:

This Lab course is intended to practice and do experiment on concepts taught in theory class of 'Operating Systems' and gain insight into functioning of the Operating Systems.

COURSE OUTCOMES:

Students should be able to demonstrate basic knowledge about Operating System, be able to apply OS concepts such as processes, memory and file systems to system design, able to configure OS in an efficient and secure manner, and become an advance user of operating system.

COURSE CONTENTS:

S.No.	Topics for Practice
1	Revision practice of various commands like man, cp, mv, ln, rm, unlink, mkdir, rmdir.
2	Implement two way process communication using pipes
3	Implement message queue form of IPC
4	Implement shared memory and semaphore form of IPC
5	Simulate the CPU scheduling algorithms - Round Robin, SJF, FCFS, priority
6	Simulate Bankers algorithm for Deadlock Avoidance and Prevention
7	Simulate all FIFO Page Replacement Algorithm using C program
8	Simulate all LRU Page Replacement Algorithms using C program
9	Simulate Paging Technique of Memory Management
10	Practice various commands/utilities such as catnl, uniq, tee, pg, comm, cmp, diff, tr, tar, cpio, mount, umount, find, umask, ulimit, sort, grep, egrep, fgrep cut, paste, join, du, df, ps, who, etc and many more.

This is a skill course. More student practice and try to find solution on their own, better it will be.

REFERENCE BOOKS:

1. Operating System Concepts, Silberschatz, Abraham and Galvin, Peter, Wiley India Limited
2. UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education
3. Operating System Concepts, Ekta Walia, Khanna Publishing House

INTRODUCTION TO DBMS LAB

Course Code	CS 4008 (Same as CI/IT 4008)
Course Title	Introduction to DBMS Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	CS 3006 Computer Programming Lab
Course Category	PC

COURSE LEARNING OBJECTIVES:

This Lab course is intended to practice whatever is taught in theory class of 'Introduction to DBMS'. A few sample case studies are listed with some suggested activities. More case studies may be added to this list. You need to develop these case studies, apply all relevant concepts learnt in theory class as the course progress, identify activities/operations that may be performed on the database. It will be a good idea to also use concepts learnt in the course on Software Engineering/SSAD.

COURSE OUTCOMES:

After completing the course, the students will understand

- (i) How to design a database, database-based applications
- (ii) How to use a DBMS
- (iii) The critical role of database system in designing several information system-based software systems or applications.

COURSE CONTENTS:

S.No.	Topics for Practice
1	Case Study-1: Employee database – 'Create' employee table, 'Select' and display an employee matching a given condition, 'Delete' duplicate records, delete rows using triggers, insert and update records, find net salary, etc.
2	Case Study-2: Visitor Management database
3	Case Study-3: Students Academic database
4	Case Study-4: Inventory Management System database
5	Case study-5: Bank Operations database
6	Case Study-6: Bus Operator (Roadways) – Do related activities such as prepare E-R Model, Relational Model, do Normalization, Create Tables, Insert data, Delete Data, Query database, create stored procedures, etc.

This is a skill course. More student practice and try to find solution on their own, better it will be.

REFERENCE BOOKS:

1. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education
2. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, Tata McGraw-Hill, New Delhi, India.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw- Hill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, Rick F.Vander Lans, Pearson Education

COMPUTER NETWORKS LAB

Course Code	CS 4009 (Same as CI/IT 4009)
Course Title	Computer Networks Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	-----
Course Category	PC

COURSE LEARNING OBJECTIVES:

This Lab course is intended to practice whatever is taught in theory class of 'Computer Networks'. Some of the things that should necessary be covered in lab are listed below:

COURSE OUTCOMES:

1. Understanding of computer networks, issues, limitations, options available.
2. Able to configure basic small LAN and connect computers to it.

COURSE CONTENTS:

S.No.	Topics for Practice
1	Showing various types of networking cables and connectors, identifying them clearly
2	Looking at specifications of cables and connectors of various companies on Internet, find out differences.
3	Making patch cords using different types of cables and connectors - crimping, splicing, etc
4	Demonstration of different type of cable testers, using them for testing patch cords prepared by the students in Lab and standard cables prepared by professionals
5	Configuring computing devices (PC, Laptop, Mobile, etc) for network, exploring different options and their impact – IP address, gateway, DNS, security options, etc
6	Showing various networking devices – NICs, Hub, Switch, Router, WiFi access point, etc.
7	Looking at specifications of various networking devices various companies on Internet, find out differences.
8	Setting up a small wired LAN in the Lab
9	Setting up a small wireless LAN in the Lab

This is a skill course. More student practice and try to find solution on their own, better it will be.

REFERENCE BOOKS:

1. Cisco press books on CCNA
2. User manual of networking devices available in the lab
3. Wiki pages on networking devices

WEB TECHNOLOGIES LAB

Course Code	CS 4010(Same as CB/CI 4010)
Course Title	Web Technologies Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	-----
Course Category	PC

COURSE LEARNING OBJECTIVES:

This Lab course is intended to practice whatever is taught in theory class of 'Web Technologies'. Some of the things that should necessary be covered in lab are listed below:

COURSE OUTCOMES:

Student will be able to program web applications using and will be able to do the following:

1. Use LAMP Stack for web applications
2. Use Tomcat Server for Servlets and JSPs
3. Write simple applications with Technologies like HTML, Javascript, AJAX, PHP, Servlets and JSPs
4. Connect to Database and get results
5. Parse XML files using Java (DOM and SAX parsers)

Student will be able to develop/build a functional website with full features.

COURSE CONTENTS:

S.No.	Topics for Practice
1	Coding Server Client Programs
2	Developing Web Application using HTML, JavaScript
3	Developing Advanced Web Application Programs using CSS
4	Practicing PHP : Basics
5	Practicing PHP : Web Application Development
6	Practicing PHP: MySql - tiered Applications
7	Developing a fully functional Web Service Application using all the technologies learned in this course.

REFERENCE BOOKS:

1. "Web Technologies--A Computer Science Perspective", Jeffrey C.Jackson,
2. "Internet & World Wide Web How To Program", Deitel, Deitel, Goldberg, Pearson Education
3. "Web programming- Building Internet Application", Chris Bales
4. Web Applications: Concepts and Real World Design, Knuckles

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

Course Code	CS 4222 (Same in All Branches of Engg.)
Course Title	Essence of Indian Knowledge and Tradition
Number of Credits	0(L-2,T-0, P-0)
Prerequisites	None
Course Category	AU

COURSE CONTENTS:

Basic Structure of Indian Knowledge System:

- (i) वेद,
- (ii) उन्नवेद (आयुर्वेद, धनुर्वेद, गन्धर्ववेद, स्थानतत्त्वआदयः)
- (iii) वेदशाखाः (शिल्प, कला, ननुत, व्याकरण, ज्योतिषशास्त्रादयः),
- (iv) उन्नथाङ्ग (धर्मशास्त्र, रीत्याशास्त्र, मुरथाण, तकशास्त्रादयः)
 - Modern Science and Indian Knowledge System
 - Yoga and Holistic Health care
 - Case Studies.

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. V. Sivarama Krishna, " Cultural Heritage of India- Course Material", Bhartiya Vidya Bhavan, Mumbai, fifth Edition, 2014.
2. Swami Jitatmanand, " Modern Physics and Vedant", Bhartiya Vidya Bhavan.
3. Fritz of Capra, " The wave of Life".
4. Fritz of Capra, " Tao of Physics".
5. V N Jha, " Tarka sangraha of Annam Bhatta, International" Cinmay Foundation, Velliarnad, Amakum.
6. R N Jha, " Science of Consciousness Psychotherapy and Yoga Practices" Vidya nidhi Prakasham, Delhi, 2016.

GOVERNMENT OF RAJASTHAN
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SEMESTER SCHEME-2020-21



V SEMESTER
(SESSION 2021-2022 & ONWARDS)

INTRODUCTION TO E-GOVERNANCE

Course Code	CS 5001(Same as IT 5001)
Course Title	Introduction to e-Governance
Number of Credits	3(L: 2, T: 1, P: 0)
Prerequisites	-----
Course Category	PC

COURSE LEARNING OBJECTIVES:

To cover the concepts of e-Governance and to understand how technologies and business models shape the contours of government for improving citizen services and bringing in transparency.

COURSE OUTCOMES:

Through exposure to introductory ideas and practices followed in a selected number of e-Governance initiatives in India, the course will help students to understand and appreciate the essence of e-Governance.

COURSE CONTENT:**UNIT 1:**

- 1.1 Exposure to emerging trends in ICT for development
- 1.2 Understanding of design and implementation of
 - 1.2.1 e-Government projects,
 - 1.2.2 e-governance lifecycle.

UNIT 2:

- 2.1 Need for Government Process Re-engineering (GPR)
National e-Governance Plan(NeGP) for India
- 2.2 SMART Governments & Thumb Rules

UNIT 3:

- 3.1 Architecture and models of e-Governance, including Public Private Partnership (PPP)
- 3.2 Need for Innovation and Change Management in e-Governance
- 3.3 Critical Success Factors
- 3.4 Major issue including corruption, resistance for change, e-Security and Cyber laws

UNIT 4:

- 4.1 Focusing on Indian initiatives and their impact on citizens;
- 4.2 Sharing of case studies to highlight best practices in managing e-Governance projects in Indian context.
- 4.3 Visits to local e-governance sites (CSC, eSeva, Post Office, Passport Seva Kendra, etc) as part of Tutorials.

UNIT 5:

- 5.1 Mini Projects by students in groups – primarily evaluation of various e-governance projects

REFERENCE BOOKS:

1. Managing Transformation –Objectives to Outcomes. J Satyanarayana, Prentice Hall India
2. The State, IT and Development. Kenneth Kenniston, RK Bagga and Rohit Raj Mathur, Sage Publications India Pvt Ltd.
3. e-Government -The Science of the Possible. J Satyanarayana, Prentice Hall, India
4. <http://www.csi-sigegov.org/publications.php>
5. <https://negd.gov.in>
6. <https://www.nisg.org/case-studies-on-e-governance-in-india>

INTERNET OF THINGS

Course Code	CS 5002(Same as CI/ IT 5002)
Course Title	Internet of Things
Number of Credits	3(L: 2, T: 1, P: 0)
Prerequisites	-----
Course Category	PC

COURSE LEARNING OBJECTIVES:

Internet of Things (IoT) is presently an important technology with wide ranging interest from Government, academia and industry. IoT cuts across different application domain verticals ranging from civilian to defence sectors which includes agriculture, space, health care, manufacturing, construction, water, mining, etc. Today it is possible to build different IoT solutions such as shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

COURSE OUTCOMES:

Students will have good understanding of various aspect of IoT, know some tools and have basic implementation skills.

COURSE CONTENTS:

UNIT 1:

- 1.1 Introduction to IoT;
- 1.2 Sensing;
- 1.3 Actuation

UNIT 2 :

- 2.1 Basics of IoT Networking,
- 2.2 Communication Protocols,
- 2.3 Sensor networks

UNIT 3:

- 3.1 Introduction to Arduino programming,
- 3.2 Integration of Sensors/Actuators to Arduino

UNIT 4:

- 4.1 Implementation of IoT with Raspberry Pi;
- 4.2 Data Handling Analytics

UNIT 5:

- 5.1 Case Studies: Agriculture, Healthcare, Activity Monitoring

REFERENCE BOOKS:

1. https://nptel.ac.in/noc/individual_course.php?id=noc17-cs22
2. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
3. Internet of Things by Dr. Jeeva Jose, Khanna Publishing House (Edition 2017)
4. "Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti (Universities Press)
5. *Internet of Things: Architecture and Design Principles*, Raj Kamal, McGraw Hill
6. Research papers

ECONOMIC POLICIES IN INDIA

Course Code	CS 51001(Same in All Branches of Engg.)
Course Title	Economic Policies in India
Number of Credits	3 (L:3,T:0,P:0)
Prerequisites	NIL
CourseCategory	OE

COURSE LEARNING OBJECTIVES:

The objective of this course is to familiarize the students of different streams with the basic concepts, structure, problems and issues concerning Indian economy.

CO1	Understand Indian economics policy, planning strategies
CO2	It will enable to students to comprehend theoretical and empirical development across countries and region for policy purposes
CO3	Development Economics as a discipline encompasses different approach to the problems of unemployment, poverty, income generation, industrialization from different perspectives
CO4	Able to identify the problems and capable to decide the application for future development
CO5	Analyze economic issues and find solution to complex economic problems and take correct economic judgment

COURSE CONTENTS:**1. BASIC FEATURES AND PROBLEMS OF INDIAN ECONOMY:**

- 1.1. Economic History of India;
- 1.2. Nature of Indian Economy
- 1.3. Demographic features and Human Development Index,
- 1.4. Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.

2. SECTORAL COMPOSITION OF INDIAN ECONOMY:

- 2.1. Issues in Agriculture sector in India,
- 2.2. land reforms
- 2.3. Green Revolution
- 2.4. agriculture policies of India,

3. INDUSTRIAL DEVELOPMENT,

- 3.1. Small scale and cottage industries,
- 3.2. Industrial Policy,
- 3.3. Public sector in India,
- 3.4. Service sector in India.

4. ECONOMIC POLICIES:

- 4.1. Economic Planning in India,
- 4.2. Planning commission v/s NITI Aayog,
- 4.3. Five Year Plans,
- 4.4. Monetary policy in India,
- 4.5. Fiscal Policy in India,
- 4.6. Centre state Finance Relations,
- 4.7. Finance commission in India
- 4.8. LPG policy in India

5. EXTERNAL SECTOR IN INDIA

- 5.1. India's foreign trade value composition and direction,
- 5.2. India Balance of payment since 1991,
- 5.3. FDI in India,
- 5.4. Impact of Globalization on Indian Economy,
- 5.5. WTO and India.

REFERENCE BOOKS:

1. Dutt Rudder and K.P.M Sunderam (2017). Indian Economy .S Chand & Co.Ltd. New Delhi.
2. Mishra S. K & V. K Puri (2017). Indian Economy and Its Development Experience. Himalaya Publishing House.
3. Singh, Ramesh, (2016): Indian Economy, Tata-McGraw Hill Publications, New Delhi.
4. Dhingra, I.C., (2017): March of the Indian Economy, Heed Publications Pvt. Ltd.
5. Karam Singh Gill, (1978): Evolution of the Indian Economy, NCERT, NewDelhi
6. Kaushik Basu (2007): The Oxford Companion to Economics of India ,Oxford University Press.

SEMESTER SCHEME 2020-2021

ENGINEERING ECONOMICS & ACCOUNTANCY

Course Code	CS 51002 (Same in All Branches of Engg.)
Course Title	Engineering Economics & Accountancy
Number of Credits	3 (L:3,T:0,P:0)
Prerequisites	NIL
Course Category	OE

COURSE OBJECTIVES

- To acquire knowledge of basic economicst of a cilitate the process of economic decision making.
- To acquire knowledge on basic financial management aspects.
- To develop the basic skills to analyze financial statements.

COURSE OUTCOMES:

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

CO1	Understand the macro-economic environment of the business and its impact on enterprise
CO2	Understand cost elements of the product and its effect on decision making
CO3	Prepare accounting records and summarize and interpret the accounting datafor managerial decisions
CO4	Understand accounting systems and analyze financial statements using ratio analysis
CO5	Understand the concepts of financial management and investment

COURSE CONTENTS**1. INTRODUCTION:**

- 1.1. Managerial Economics;
- 1.2. Relationship with other disciplines;
- 1.3. Firms: Types, objectives and goals;
- 1.4. Managerial decisions;
- 1.5. Decision analysis.

2. DEMAND & SUPPLY ANALYSIS:

- 2.1. Demand;
 - 2.1.1. Types of demand;
 - 2.1.2. Determinants of demand;
 - 2.1.3. Demand function;
 - 2.1.4. Demand elasticity;
 - 2.1.5. Demand forecasting;
- 2.2. Supply;
 - 2.2.1. Determinants of supply;
 - 2.2.2. Supply function;
 - 2.2.3. Supply elasticity.

3. PRODUCTION AND COST ANALYSIS:

- 3.1. Production function;
- 3.2. Returns to scale;
- 3.3. Production optimization;
- 3.4. Least cost input; Iso quants;
- 3.5. Managerial uses of production function;
- 3.6. Cost Concepts;
 - 3.6.1. Cost function;
 - 3.6.2. Types of Cost;
 - 3.6.3. Determinants of cost;
 - 3.6.4. Short run and Long run cost curves;
 - 3.6.5. Cost Output Decision;
 - 3.6.6. Estimation of Cost.

4. PRICING:

- 4.1. Determinants of Price;
- 4.2. Pricing under different objectives and different market structures;
- 4.3. Price discrimination;
- 4.4. Pricing methods in practice;
- 4.5. Role of Government in pricing control.

5. FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT):

- 5.1. Balance sheet and related concepts;
- 5.2. Profit & Loss Statement and related concepts;
- 5.3. Financial Ratio Analysis;
- 5.4. Cash flow analysis;
- 5.5. Funds flow analysis;
- 5.6. Comparative financial statements;
- 5.7. Analysis & Interpretation of financial statements;
- 5.8. Investments;
- 5.9. Risks and return evaluation of investment decision;
- 5.10. Average rate of return;
- 5.11. Payback Period;
- 5.12. Net Present Value;
- 5.13. Internal rate of return,

REFERENCE BOOKS:

- 1. Mc Guigan, Moyer and Harris, 'Managerial Economics; Applications, Strategy and Tactics', Thomson South Western, 10th Edition, 2005.
- 2. Prasanna Chandra. 'Fundamentals of Financial Management', Tata McGraw Hill Publishing Ltd., 4th edition, 2005.
- 3. Samuelson. Paul A and Nordhaus W. D., 'Economics', Tata McGraw Hill Publishing Company Limited, New Delhi, 2004.
- 4. Paresh Shah, 'Basic Financial Accounting for Management', Oxford University Press, New Delhi, 2007.
- 5. Salvatore Dominick, 'Managerial Economics in a global economy'. Thomson South Western, 4th Edition, 2001.

DATA SCIENCES: DATA WAREHOUSING AND DATA MINING

Course Code	CS 50031(Same as CI/IT 50031)
Course Title	Data Sciences: Data Warehousing and Data Mining
Number of Credits	3(L: 3, T: 0, P: 0)
Prerequisites	-----
Course Category	PE

COURSE LEARNING OBJECTIVES:

Introduce students to the domain of Data Warehousing and Data Mining

COURSE OUTCOMES:

Student will have general idea about Data Warehousing and Data Mining techniques, will be able to explore further and effectively use related tools.

COURSE CONTENTS:**UNIT 1:INTRODUCTION**

- 1.1. Motivation,
- 1.2. Importance,
- 1.3. Definitions,
- 1.4. Kind of Data,
- 1.5. Data Mining Functionalities,
- 1.6. Kinds of Patterns,
- 1.7. Classification of Data Mining Systems,
- 1.8. Data Mining Task Primitives,
- 1.9. Integration of A Data Mining System with A Database or Data Warehouse System,
- 1.10. Major Issues in Data Mining,
- 1.11. Types of Data Sets and Attribute Values,
- 1.12. Basic Statistical Descriptions of
 - 1.12.1. Data,
 - 1.12.2. Data Visualization,
 - 1.12.3. Measuring Data Similarity.
- 1.13. PREPROCESSING:
 - 1.13.1. Data Quality,
 - 1.13.2. Major Tasks in Data Preprocessing,
 - 1.13.3. Data Reduction,
 - 1.13.4. Data Transformation and Data Discretization,
 - 1.13.5. Data Cleaning and Data Integration.

UNIT 2:DATA WAREHOUSING AND ON-LINE ANALYTICAL PROCESSING

- 2.1. Data Warehouse basic concepts,
- 2.2. Data Warehouse Modeling - Data Cube and OLAP,
- 2.3. Data Warehouse Design and Usage,
- 2.4. Data Warehouse Implementation,
- 2.5. Data Generalization by Attribute-Oriented Induction,
- 2.6. Data Cube Computation.

UNIT 3:PATTERNS, ASSOCIATIONS AND CORRELATIONS

- 3.1. Mining Frequent Patterns,
- 3.2. Associations and Correlations:
 - 3.2.1. Basic Concepts,
 - 3.2.2. Efficient and Scalable Frequent Item set Mining Methods,
 - 3.2.3. Pattern Evaluation Methods,
 - 3.2.4. Applications of frequent pattern and associations.
- 3.3. Frequent Patterns and Association Mining:
 - 3.3.1. A Road Map,
 - 3.3.2. Mining Various Kinds of Association Rules,
 - 3.3.3. Constraint-Based Frequent Pattern Mining,
 - 3.3.4. Extended Applications of FrequentPatterns

UNIT 4:CLASSIFICATION

- 4.1. Basic Concepts,
- 4.2. Decision Tree Induction,
- 4.3. Bayesian Classification Methods,

- 4.4. Rule-Based Classification,
- 4.5. Model Evaluation and Selection,
- 4.6. Techniques to Improve Classification Accuracy:
 - 4.6.1. Ensemble Methods,
 - 4.6.2. Handling Different Kinds of Cases in Classification,
 - 4.6.3. Classification by Neural Networks,
 - 4.6.4. Support Vector Machines,
 - 4.6.5. Pattern-Based Classification,
 - 4.6.6. Lazy Learners (or Learning from Your Neighbors).

UNIT 5: CLUSTER ANALYSIS

- 5.1. Basic Concepts of Cluster Analysis,
- 5.2. Clustering Structures,
- 5.3. Major Clustering Approaches,
 - 5.3.1. Partitioning Methods,
 - 5.3.2. Hierarchical Methods,
 - 5.3.3. Density-Based Methods,
 - 5.3.4. Model-Based Clustering,
- 5.4. Why outlier analysis,
- 5.5. Identifying and handling of outliers,
- 5.6. Outlier Detection Techniques.
- 5.7. WEB MINING:
 - 5.7.1. Basic concepts of web mining,
 - 5.7.2. different types of web mining,
 - 5.7.3. PAGE RANK Algorithm,
 - 5.7.4. HITS Algorithm

REFERENCE BOOKS:

1. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier
2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, Pearson Education
3. Amitesh Sinha, Data Warehousing, Thomson Learning, India.
4. Xingdong Wu, Vipin Kumar, the Top Ten Algorithms in Data Mining, CRC Press, UK.

FUNDAMENTALS OF AI

Course Code	CS 50032
Course Title	Fundamentals of AI
Number of Credits	3(L: 3, T: 0, P: 0)
Prerequisites	-----
Course Category	PE

COURSE LEARNING OBJECTIVES:

To introduce students to the domain of Artificial Intelligence.

COURSE OUTCOMES:

Student will have general idea about Artificial Intelligence, will be able to explore AI tools effectively.

COURSE CONTENTS:**UNIT 1: INTRODUCTION**

- 1.1. Overview and Historical Perspective,
- 1.2. Turing test,
- 1.3. Physical Symbol Systems and the scope of Symbolic AI,
- 1.4. Agents.

UNIT 2: SEARCH

- 2.1. Heuristic Search:
 - 2.1.1. Best First Search,
 - 2.1.2. Hill Climbing,
 - 2.1.3. Beam Search,
 - 2.1.4. Tabu Search
- 2.2. Randomized Search:
 - 2.2.1. Simulated Annealing,
 - 2.2.2. Genetic Algorithms,
 - 2.2.3. Ant Colony Optimization.

UNIT 3:

- 3.1. Finding Optimal Paths:
 - 3.1.1. Branch and Bound,
 - 3.1.2. A*,
 - 3.1.3. IDA*,
 - 3.1.4. Divide and Conquer approaches,
 - 3.1.5. Beam Stack Search.
- 3.2. Problem Decomposition:
 - 3.2.1. Goal Trees,
 - 3.2.2. AO*,
 - 3.2.3. Rule Based Systems,
 - 3.2.4. Rete Net.
- 3.3. Game Playing:
 - 3.3.1. Minimax Algorithm,
 - 3.3.2. AlphaBeta Algorithm,
 - 3.3.3. SSS*.

UNIT 4:

- 4.1. Planning and Constraint Satisfaction:
 - 4.1.1. Domains,
 - 4.1.2. Forward and Backward Search,
 - 4.1.3. Goal Stack Planning,
 - 4.1.4. Plan Space Planning,
 - 4.1.5. Graphplan,
 - 4.1.6. Constraint Propagation.

UNIT 5:

- 5.1. Logic and Inferences:
 - 5.1.1. Propositional Logic,

- 5.1.2 First Order Logic,
- 5.1.3 Soundness and Completeness,

5.1.4 Forward and Backward chaining.

REFERENCE BOOKS:

1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India)
2. <https://nptel.ac.in/courses/106106126/>
3. Stefan Edelkamp and Stefan Schroedl. Heuristic Search, Morgan Kaufmann.
4. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, A K Peters/CRC Press
5. Elaine Rich and Kevin Knight. Artificial Intelligence, Tata McGraw Hill.
6. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, Prentice Hall
7. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House

SEMESTER SCHEME 2020-2021

ADVANCE COMPUTER NETWORKS

Course Code	CS 50041(Same as IT 50041)
Course Title	Advance Computer Networks
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	-----
Course Category	PE

COURSE LEARNING OBJECTIVES:

Introduce Advance Networking Concepts, Theories and Tools

COURSE OUTCOMES:

- 1.Understanding core concepts/theories/algorithms of computer networks
- 2.Some hands-on capability on various network devices and tools
- 3 Capability to design and implement a computer network

COURSE CONTENT:**UNIT 1:**

- 1.1. Review of Networking Basics;
- 1.2. Advance Topics in IPv4 –
 - 1.2.1. Subnetting,
 - 1.2.2. Multicasting,
 - 1.2.3. Multicast Routing Protocols (IGMP, PIM, DVMRP);
- 1.3. Advance Topics in TCP –
 - 1.3.1. flow management,
 - 1.3.2. congestion avoidance,
 - 1.3.3. protocol spoofing;
- 1.4. IPv6

UNIT 2:

- 2.1. Telecom Networks,
- 2.2. Switching Techniques;
- 2.3. Introduction to
 - 2.3.1. Frame Relay,
 - 2.3.2. ATM,
 - 2.3.3. MPLS;
- 2.4. VSAT Communication –
 - 2.4.1. Star and Mesh architectures,
 - 2.4.2. bandwidth reservation;
- 2.5. Wireless Networks –
 - 2.5.1. WiFi,
 - 2.5.2. WiMax,
- 2.6. Cellular Phone Technologies –
 - 2.6.1. GSM,
 - 2.6.2. CDMA,
 - 2.6.3. 3G,
 - 2.6.4. 4G

UNIT 3:

- 3.1. Network Redundancy,
- 3.2. Load Balancers,
- 3.3. Caching,
- 3.4. Storage Networks;
- 3.5. QoS;
- 3.6. Network Monitoring –
 - 3.6.1. SNMP,
 - 3.6.2. RMON;

UNIT 4: ADVANCE SCRIPTING

- 4.1. Introduction to Network Security –

- 4.1.1. VLAN,
- 4.1.2. VPN,
- 4.1.3. Firewall,
- 4.1.4. IPS,
- 4.1.5. Proxy Servers

UNIT 5: PHP

- 5.1. Network Simulation,
- 5.2. Network design case studies and exercises,
- 5.3. IP Addressing schema,
- 5.4. Protocol Analysers (Wireshark, etc)

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REFERENCE BOOKS:

1. RFCs and Standards Documents (www.ietf.org and other standard body websites)
2. Communication Networking – An Analytical Approach, Anurag-Manjunath-Joy
3. TCP/IP Illustrated (Vol.1,2), Stevens
4. Data Networks, Bertsekas-Gallager
5. An Engineering Approach to Computer Networking, S. Keshav

SEMESTER SCHEME 2020-2021

MOBILE COMPUTING

Course Code	CS 50042
Course Title	Mobile Computing
Number of Credits	3(L: 3, T: 0, P: 0)
Prerequisites	-----
Course Category	PE

COURSE LEARNING OBJECTIVES:

To teaches how to build mobile apps for Android. Students are expected to work on a project as part of the course.

COURSE OUTCOMES:

Will be able to develop and deploy basic mobile applications.

COURSE CONTENTS:**UNIT 1:**

- 1.1. A brief history of Mobile,
- 1.2. Types of mobile phone generations,
- 1.3. The Mobile Ecosystem,
- 1.4. Types of Mobile Applications,
- 1.5. Mobile Information Architecture Android Versions,
- 1.6. Features of Android,
- 1.7. Android Architecture,
- 1.8. Installing Android SDK Tools,
- 1.9. Configuring Android in Eclipse IDE,
- 1.10. Android Development Tools (ADT),
- 1.11. Creating Android Virtual Devices (AVD)

UNIT 2:

- 2.1. Creating first android application,
- 2.2. Anatomy of android application,
- 2.3. Deploying Android app on USB connected Android device,
- 2.4. Android application components,
- 2.5. Activity life cycle,
- 2.6. Understanding activities,
- 2.7. Exploring Intent objects,
- 2.8. Intent Types,
- 2.9. Linking activities using intents

UNIT 3:

- 3.1. Fragments life cycle,
- 3.2. Interaction between fragments,
- 3.3. Understanding the components of a screen (Layouts),
- 3.4. Adapting to display orientation,
- 3.5. Action Bar,
- 3.6. Views(UI Widgets)-Button,
- 3.7. Toast,
- 3.8. ToggleButton,
- 3.9. CheckBox,
- 3.10. RadioButton,
- 3.11. Spinner,
- 3.12. WebView,
- 3.13. EditText,
- 3.14. DatePicker,
- 3.15. TimePicker,
- 3.16. ListView,
- 3.17. ProgressBar,
- 3.18. Analog and Digital clock,

- 3.19. Handling UI events,
- 3.20. List fragment,
- 3.21. Dialog fragment

UNIT 4:

- 4.1. Menus-Option,
- 4.2. Context,
- 4.3. Popup,
- 4.4. Images-ImageView,
- 4.5. ImageSwitcher,
- 4.6. AlertDialog,
- 4.7. Alarm manager,
- 4.8. SMS,
- 4.9. E-mail,
- 4.10. Media Player,
- 4.11. Using camera,
- 4.12. recording video,
- 4.13. Handling Telephony Manage

UNIT 5: PHP

- 5.1. Storing the data persistently-Data Storage Options:
 - 5.1.1. preferences,
 - 5.1.2. Internal Storage,
 - 5.1.3. External Storage,
- 5.2. Content Provider ,
- 5.3. The SQLite database,
- 5.4. Connecting with SQLite database and operations-
 - 5.4.1. Insert,
 - 5.4.2. Delete,
 - 5.4.3. Update,
 - 5.4.4. Fetch,
- 5.5. Publishing android applications,
- 5.6. Deploying APK files

REFERENCE BOOKS:

1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley Publishing, Inc.
2. Pradeep Kothari, "Android Application Development Black Book", DreamTech Press
3. James C. Sheusi, "Android Application Development for Java Programmers", Cengage Learning
4. Mark L. Murphy, "Beginning Android", Wiley India Pvt Ltd
5. Sayed Y Hashimi and Satya Komatineni (2009), "Pro Android", Wiley India Pvt Ltd
6. Reto Meier, Professional Android 4 Application Development, Wiley India Pvt Ltd

DATA SCIENCES: DATA WAREHOUSING AND DATA MINING LAB

Course Code	CS 50051(Same as IT 50051)
Course Title	Data Sciences: Data Warehousing and Data Mining Lab
Number of Credits	1(L: 0, T: 0, P: 2)
Prerequisites	-----
Course Category	PE

COURSE LEARNING OBJECTIVES:

Introduce students to the practical domain of Data Warehousing and Data Mining.

COURSE CONTENT:

S.No.	Topics for Practice
1	Study and explore WEKA environment.
2	Create .arff file using WEKA.
3	Demonstration of pre-processing of .arff file.
4	Demonstrate performing association rule mining on data sets.
5	Demonstrate performing classification on data sets.
6	Demonstrate performing clustering on data sets.
7	Demonstrate performing Regression on data sets.
8	Demonstration of association rule mining.
9	Perform classification using Bayesian classification algorithm.
10	Perform the cluster analysis by k-means method.

REFERENCE BOOKS:

5. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier
6. Margaret H Dunham, Data Mining Introductory and Advanced Topics, Pearson Education
7. Amitesh Sinha, Data Warehousing, Thomson Learning, India.
8. Xingdong Wu, Vipin Kumar, the Top Ten Algorithms in Data Mining, CRC Press, UK.

COURSE OUTCOMES:

Student will have general idea about Data Warehousing and Data Mining tool (WEKA), will be able to explore further and effectively use related tools.

FUNDAMENTALS OF AI LAB

Course Code	CS 50052
Course Title	Fundamentals of AI Lab
Number of Credits	1(L: 0, T: 0, P: 2)
Prerequisites	-----
Course Category	PE

COURSE LEARNING OBJECTIVES:

To introduce students to the domain of Artificial Intelligence Programming

COURSE OUTCOMES:

Student will have general idea about Artificial Intelligence Programming; will be able to explore Prolog effectively.

COURSE CONTENT:

S.No.	Topics for Practice
1	Study of Prolog features and format
2	Write simple fact for the statements using Prolog.
3	Programs using variables in Prolog
4	Programs using rules in Prolog
5	Programs using Input, Output and fail predicates in Prolog
6	Programs using cut,not,fail predicates in Prolog
7	Write a program to solve 8 queens problem
8	Programs to demonstrate depth first search
9	Programs to demonstrate best first search
10	Write a program to solve traveling salesman problem.

REFERENCE BOOKS:

1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India)
2. <https://nptel.ac.in/courses/106106126/>
3. Stefan Edelkamp and Stefan Schroedl. Heuristic Search, Morgan Kaufmann.
4. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, A K Peters/CRC Press
5. Elaine Rich and Kevin Knight. Artificial Intelligence, Tata McGraw Hill.
6. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, PrenticeHall
7. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House

GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR
SEMESTER SCHEME-2020-21



VI SEMESTER
(SESSION 2021-2022 & ONWARDS)

ENTREPRENEURSHIP AND START-UPS

Course Code	CS 6111 (Same in All Branches of Engg.)
Course Title	Entrepreneurship and Start-ups
Number of Credits	4 (L-3 ,T-1, P-0)
Prerequisites (Course code)	None
Course Category	HS

COURSE LEARNING OBJECTIVES:

1. Acquiring Entrepreneurial spirit and resourcefulness.
2. Familiarization with various uses of human resource for earning dignified means of living.
3. Understanding the concept and process of entrepreneurship-its contribution and role in the growth and development of individual and the nation.
4. Acquiring entrepreneurial quality, competency, and motivation.
5. Learning the process and skills of creation and management of entrepreneurial venture.

LEARNING OUTCOME:

Upon completion of the course, these student will be able to demonstrate knowledge of the following topics:

1. Understanding the dynamic role of entrepreneurship and small businesses
2. Organizing and Managing a Small Business
3. Financial Planning and Control
4. Forms of Ownership for Small Business
5. Strategic Marketing Planning
6. New Product or Service Development
7. Business Plan Creation

COURSE CONTENTS:**1. INTRODUCTION TO ENTREPRENEURSHIP AND START-UPS**

- 1.1. Definitions, Traits of an entrepreneur, Intrapreneurship, Motivation
- 1.2. Types of Business Structures,
- 1.3. Similarities / differences between entrepreneurs and managers.

2. BUSINESS IDEAS AND THEIR IMPLEMENTATION

- 2.1. Discovering ideas and visualizing the business
- 2.2. Activity map
- 2.3. Business Plan

3. IDEA TO START-UP

- 3.1. Market Analysis– Identifying the target market,
- 3.2. Competition evaluation and Strategy Development,
- 3.3. Marketing and accounting,
- 3.4. Risk analysis

4. MANAGEMENT

- 4.1. Company's Organization Structure,
- 4.2. Recruitment and management of talent.
- 4.3. Financial organization and management

5. FINANCING AND PROTECTION OF IDEAS

- 5.1. Financing methods available for start-ups in India
- 5.2. Communication of Ideas to potential investors– Investor Pitch
- 5.3. Patenting and Licenses

6. EXIT STRATEGIES FOR ENTREPRENEURS ,BANKRUPTCY, AND SUCCESSION AND HARVESTING STRATEGY

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN-978-0984999392
2.	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN-978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN-978-0755388974
4.	The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business	Clayton M. Chris Tensen	Harvard business ISBN:978-142219602

SUGGESTED SOFTWARE/LEARNING WEBSITES:

- <https://www.fundable.com/learn/resources/guides/startup>
- <https://corporatefinanceinstitute.com/resources/knowledge/finance/corporatestructure/>
- <https://www.finder.com/small-business-finance-tips>
- <https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/>

SEMESTER SCHEME-2020-21

PROJECT MANAGEMENT

CourseCode	CS 62001(Same in All Branches of Engg.)
CourseTitle	Project Management
NumberOfCredits	3(L:3,T:0,P:0)
Prerequisites	NIL
CourseCategory	OE

COURSE LEARNING OBJECTIVES

- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

COURSE OUTCOMES

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

CO1	Understand the importance of projects and its phases.
CO2	Analyze projects from marketing, operational and financial perspectives.
CO3	Evaluate projects based on discount and non-discount methods.
CO4	Develop network diagrams for planning and execution of a given project.
CO5	Apply crashing procedures for time and cost optimization.

COURSE CONTENTS**1. CONCEPT OF A PROJECT:**

- 1.1. Classification of projects
- 1.2. Importance of project management
- 1.3. The project Life cycle
- 1.4. Establishing project priorities (scope-cost-time)
- 1.5. Project priority matrix
- 1.6. Work break down structure.

2. CAPITAL BUDGETING PROCESS:

- 2.1. Planning -Analysis-Selection-Financing-Implementation-Review.
- 2.2. Generation and screening of project ideas
- 2.3. Market and demand analysis
- 2.4. Demand forecasting techniques.
- 2.5. Market planning and marketing research process
- 2.6. Technical analysis

3. FINANCIAL ESTIMATES AND PROJECTIONS:

- 3.1. Cost of projects
- 3.2. Means of financing
- 3.3. Estimates of sales and production-cost of production
- 3.4. Working capital requirement and its financing
- 3.5. Profitability project , cash flow statement and balance sheet.
- 3.6. Breakeven analysis.

4. BASIC TECHNIQUES IN CAPITAL BUDGETING:

- 4.1. Non discounting and discounting methods
- 4.2. pay-back period
- 4.3. Accounting rate of return
- 4.4. Net present value
- 4.5. Benefit cost ratio
- 4.6. Internal rate of return.
- 4.7. Project risk.
- 4.8. Social cost benefit analysis and economic rate of return.
- 4.9. Non-financial justification of projects.

5. PROJECT ADMINISTRATION:

- 5.1. Progress payments,
- 5.2. Expenditure planning,

- 5.3. Project scheduling and network planning,
- 5.4. Use of Critical Path Method(CPM),
- 5.5. Schedule of payments and physical progress,
- 5.6. time-cost trade off.
- 5.7. Concepts and uses of PERT
- 5.8. Cost as a function of time,
- 5.9. Project Evaluation and Review Techniques
- 5.10. Cost mechanisms.
- 5.11. Determination of least cost duration.
- 5.12. Post project evaluation.
- 5.13. Introduction to various Project management softwares.

REFERENCE BOOKS

- 1. Project planning, analysis, selection, implementation and review –Prasannachandra–Tata McGraw Hill
- 2. Project Management – the Managerial Process– Clifford F. Gray & Erik W. Larson-McGrawHill
- 3. Project management- David I Cleland- McGraw Hill International Edition, 1999
- 4. Project Management– Gopala krishnan– Mcmillan India Ltd.
- 5. Project Management- Harry – Maylor – Pearson Publication

SEMESTER SCHEME-2020-21

RENEWABLE ENERGY TECHNOLOGIES

CourseCode	CS 62002 (Same in All Branches of Engg.)
CourseTitle	Renewable Energy Technologies
NumberOfCredits	3 (L:3,T:0,P:0)
Prerequisites	NIL
CourseCategory	OE

COURSE LEARNING OBJECTIVES

- To understand present and future scenario of world energy use.
- To understand fundamentals of solar energy systems.
- To understand basics of wind energy.
- To understand bio energy and its usage in different ways.
- To identify different available non-conventional energy sources.

COURSE OUTCOMES

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

CO1	Understand present and future energy scenario of the world.
CO2	Understand various methods of solar energy harvesting.
CO3	Identify various wind energy systems.
CO4	Evaluate appropriate methods for Bio energy generations from various Bio wastes.
CO5	Identify suitable energy sources for a location.

COURSE CONTENTS**1. INTRODUCTION:**

- 1.1. World Energy Use;
- 1.2. Reserves of Energy Resources;
- 1.3. Environmental Aspects OF Energy Utilisation;
- 1.4. Renewable Energy Scenario in India and around the World;
- 1.5. Potentials; Achievements/ Applications;
- 1.6. Economics of renewable energy systems.

2. SOLAR ENERGY:

- 2.1. Solar Radiation;
- 2.2. Measurements of Solar Radiation;
- 2.3. Flat Plate and Concentrating Collectors;
- 2.4. Solar direct Thermal Applications;
- 2.5. Solar thermal Power Generation
- 2.6. Fundamentals of Solar Photo Voltaic Conversion;
- 2.7. Solar Cells;
- 2.8. Solar PV Power Generation;
- 2.9. Solar PV Applications.

3. WIND ENERGY:

- 3.1. Wind Data and Energy Estimation;
- 3.2. Types of Wind Energy Systems;
- 3.3. Performance; Site Selection;
- 3.4. Details of Wind Turbine Generator;
- 3.5. Safety and Environmental Aspects.

4. BIO-ENERGY:

- 4.1. Bio mass direct combustion;
- 4.2. Bio mass gasifiers;
- 4.3. Bio gas plants;
- 4.4. Digesters;
- 4.5. Ethanol production;
- 4.6. Bio diesel;
- 4.7. Cogeneration;

- 4.8. Bio mass Applications.

5. OTHER RENEWABLE ENERGY SOURCES:

- 5.1. Tidal energy;
- 5.2. Wave Energy;
- 5.3. Open and Closed OTEC Cycles;
- 5.4. Small Hydro Geothermal Energy;
- 5.5. Hydrogen and Storage;
- 5.6. Fuel Cell Systems;
- 5.7. Hybrid Systems.

REFERENCE BOOKS

1. Non-Conventional Energy Sources, Rai. G. D., Khanna Publishers, New Delhi, 2011.
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN SponLtd.,UK,2 006.
3. Solar Energy, Sukhatme. S. P., Tata Mc Graw Hill Publishing CompanyLtd. ,New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, G N Tiwari and M K Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment A Policy Analysis for India ,NH Ravindranath, U K Rao, B Natarajan, P Monga, Tata McGraw Hill.
7. Energy and The Environment, R A Ristinen and J J Kraushaar, second edition, John Willey & Sons, New York, 2006.
8. Renewable Energy Resources, J W T widell and A D Weir, ELBS, 2006.

PRODUCT DESIGN

CourseCode	CS 63001(Same in All Branches of Engg.)
CourseTitle	Product Design
NumberOfCredits	3 (L:3,T:0,P:0)
Prerequisites	NIL
CourseCategory	OE

COURSE LEARNING OBJECTIVES

- To acquire the basic concepts of product design and development process
- To understand the engineering and scientific process in executing a design from concept to finished product
- To study the key reasons for design or redesign.

COURSE OUTCOMES

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

CO1	Understand the basic concepts of product design and development process.
CO2	Illustrate the methods to define the customer needs.
CO3	Describe an engineering design and development process.
CO4	Understand the intuitive and advanced methods used to develop and evaluate a concept.
CO5	Apply modelling and embodiment principles in product design and development process.

COURSE CONTENTS**1. DEFINITION OF A PRODUCT**

- 1.1. Types of product;
- 1.2. Levels of product;
- 1.3. Product-market mix;
- 1.4. New product development (NPD) process;
- 1.5. Idea generation methods;
- 1.6. Creativity;
 - 1.6.1. Creative attitude;
 - 1.6.2. Creative design process;
- 1.7. Morphological analysis;
- 1.8. Analysis of inter-connected decision areas;
- 1.9. Brain storming.

2. PRODUCT LIFECYCLE;

- 2.1. The challenges of Product development;
- 2.2. Product analysis;
- 2.3. Product characteristics;
- 2.4. Economic considerations;
- 2.5. Production and Marketing aspects;
- 2.6. Characteristics of successful Product development;
- 2.7. Phases of a generic product development process;
- 2.8. Customer need identification;
- 2.9. Product development practices and industry-product strategies.

3. PRODUCT DESIGN

- 3.1. Design by evolution;
- 3.2. Design by innovation;
- 3.3. Design by imitation;
- 3.4. Factors affecting product design;
- 3.5. Standards of performance and environmental factors;
- 3.6. Decision making and iteration;
- 3.7. Morphology of design (different phases);
- 3.8. Role of aesthetics in design.

4. INTRODUCTION TO OPTIMIZATION IN DESIGN

- 4.1. Economic factors in design;
- 4.2. Design for safety and reliability;

- 4.3. Role of computers in design;
- 4.4. Modeling and Simulation;
- 4.5. The role of models in engineering design;
- 4.6. Mathematical modeling;
- 4.7. Similitude and scale models;
- 4.8. Concurrent design;
- 4.9. Six sigma and design for six sigma;
- 4.10. Introduction to optimization in design;
- 4.11. Economic factors and financial feasibility in design;
- 4.12. Design for manufacturing;
- 4.13. Rapid Proto typing (RP);
- 4.14. Application of RP in product design;
- 4.15. Product Development versus Design.

5. DESIGN OF SIMPLE PRODUCTS DEALING WITH VARIOUS ASPECTS OF PRODUCT DEVELOPMENT;

- 5.1. Design Starting from need till the manufacture of the product

REFERENCE BOOKS

- 1.Product Design and Development, Karl T.Ulrichand Steven D.Eppinger, TataMc Graw–Hill edition.
- 2.Engineering Design– George E. Dieter.
- 3.An Introduction to Engineering Design methods Vijay Gupta.
- 4.Merie Crawford: New Product management, McGraw-Hill Irwin.
- 5.Chitale A K and Gupta R C,“ Product Design and Manufacturing”, Prentice Hall of India, 2005.
- 6.Kevin Otto and Kristin Wood, Product Design, Techniques in Reverse Engineering and New Product Development, Pears on education.

DISASTER MANAGEMENT

Course Code	CS 63002(Same in All Branches of Engg.)
Course Title	Disaster Management
Number of Credits	3 (L: 3, T: 0 ,P :0)
Prerequisites	NIL
Course Category	OE

COURSE LEARNING OBJECTIVES

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre and post-disaster management for some of the disasters.
- To know about various information and organizations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

COURSE OUTCOMES:

- 1.1. After completing this course, student will be:
- 1.2. Acquainted with basic information on various types of disasters
- 1.3. Knowing the precautions and awareness regarding various disasters
- 1.4. Decide first action to be taken under various disasters
- 1.5. Familiarised with organization in India which are dealing with disasters
- 1.6. Able to select IT tools to help in disaster management

COURSE CONTENTS**1. UNDERSTANDING DISASTER**

- 1.1. Understanding the Concepts and definitions of Disaster,
- 1.2. Hazard,
- 1.3. Vulnerability,
- 1.4. Risk,
- 1.5. Capacity–Disaster and Development,
- 1.6. Disaster management.

2. TYPES, TRENDS, CAUSES, CONSEQUENCES AND CONTROL OF DISASTERS

- 2.1. Geological Disasters (earth quakes, land slides,tsunami, mining);
- 2.2. Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hailstorms, avalanches, droughts, cold and heat waves)
- 2.3. Biological Disasters (epidemics, pestattacks, forestfire);
- 2.4. Technological Disasters (chemical, industrial, radiological, nuclear)
- 2.5. Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters)
- 2.6. Global Disaster Trends
- 2.7. Emerging Risks of Disasters
- 2.8. Climate Change and Urban Disasters.

3. DISASTER MANAGEMENT CYCLE AND FRAME WORK

- 3.1. Disaster Management Cycle
- 3.2. Paradigm Shift in Disaster Management.
- 3.3. Pre-Disaster
- 3.4. Risk Assessment and Analysis,
- 3.5. Risk Mapping,
- 3.6. Zonation and Microzonation,
- 3.7. Prevention and Mitigation of Disasters,
- 3.8. Early Warning System
 - 3.8.1. Preparedness,
 - 3.8.2. Capacity Development;
 - 3.8.3. Awareness.
- 3.9. During Disaster
 - 3.9.1. Evacuation
 - 3.9.2. Disaster Communication
 - 3.9.3. Search and Rescue
 - 3.9.4. Emergency Operation Centre

- 3.9.5. Incident Comm and System
- 3.9.6. Relief and Rehabilitation
- 3.10. Post-disaster
 - 3.10.1. Damage and Needs Assessment,
 - 3.10.2. Restoration of Critical Infra structure
 - 3.10.3. Early Recovery Reconstruction and Redevelopment;
 - 3.10.4. IDNDR, Yokohama Stretegy, Hyogo Frame-work of Action.

4. DISASTER MANAGEMENT IN INDIA

- 4.1. Disaster Profile of India
- 4.2. Mega Disasters of India and Lessons Learnt.
- 4.3. Disaster Management Act 2005
- 4.4. Institutional and Financial Mechanism,
- 4.5. National Policy on Disaster Management,
- 4.6. National Guidelines and Plans on Disaster Management;
- 4.7. Role of Government (local, state and national),
- 4.8. Non-Government and Inter Governmental Agencies

5. APPLICATIONS OF SCIENCE AND TECHNOLOGY FOR DISASTER MANAGEMENT

- 5.1. Geo informatics in Disaster Management (RS, GIS, GPS and RS).
- 5.2. Disaster Communication System (Early Warning and Its Dissemination).
- 5.3. Land Use Planning and Development Regulations,
- 5.4. Disaster Safe Designs and Constructions,
- 5.5. Structural and Non Structural Mitigation of Disasters
- 5.6. S & T Institutions for Disaster Management in India

REFERENCES

- 1.Publications of National Disaster Management Authority (NDMA) on Various Templates and Guide lines for Disaster Management
- 2.Bhandani, R. K., An over view on natural & man-made disasters and their reduction, CSIR, New Delhi
- 3.Srivastava, H. N., and Gupta G. D. , Management of Natural Disasters in developing countries, Daya Publishers, Delhi
- 4.Alexander, David, Natural Disasters, Kluwer Academic London
- 5.Ghosh, G .K. ,Disaster Management, APH Publishing Corporation
- 6.Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

INDIAN CONSTITUTION

CourseCode	CS 6333(Same in All Branches of Engg.)
CourseTitle	Indian Constitution
NumberOfCredits	0 (L:2,T:0;P:0)
Prerequisites(Coursecode)	None
CourseCategory	AU

COURSE CONTENT**1. THE CONSTITUTION –**

- 1.1. Introduction
- 1.2. The History of the Making of the Indian Constitution
- 1.3. Preamble and the Basic Structure, and its interpretation
- 1.4. Fundamental Rights and Duties and their interpretation
- 1.5. State Policy Principles

2. UNION GOVERNMENT

- 2.1. Structure of the Indian Union
- 2.2. President– Role and Power
- 2.3. Prime Minister and Council of Ministers
- 2.4. Lok Sabha and Rajya Sabha

3. STATE GOVERNMENT

- 3.1. Governor– Role and Power
- 3.2. Chief Minister and Council of Ministers
- 3.3. State Secretariat

4. LOCAL ADMINISTRATION

- 4.1. District Administration
- 4.2. Municipal Corporation
- 4.3. Zila Panchayat

5. ELECTION COMMISSION

- 5.1. Role and Functioning
- 5.2. Chief Election Commissioner
- 5.3. State Election Commission

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author	Publication
1.	Ethics and Politics of the Indian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi, 2008
2.	The Constitution of India	B.L.Fadia	Sahitya Bhawan; New edition(2017)
3.	Introduction to the Constitution of India	D D Basu	Lexis Nexis; Twenty-Third 2018 edition

SUGGESTED SOFTWARE / LEARNING WEBSITES:

1. <https://www.constitution.org/cons/india/const.html>
2. <http://www.legislative.gov.in/constitution-of-india>
3. <https://www.sci.gov.in/constitution>
4. <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>

MULTIMEDIA TECHNOLOGIES

Course Code	CS 60011
Course Title	Multimedia Technologies
Number of Credits	3(L: 3, T: 0, P:0)
Prerequisites	CS3002,CS4002,CS4004
Course Category	PE

COURSE LEARNING OBJECTIVES:

To introduce students to the domain of Multimedia Technologies, which explain the technologies underlying digital images, videos and audio contents, including various compression techniques and standards, and the issues to deliver multimedia content over the Internet.

COURSE OUTCOMES:

Student will understand various aspects of Multimedia and related standards. Student will be able to build multimedia content and applications and also multimedia enable Web applications and mobile applications.

COURSE CONTENTS:**UNIT 1: Introduction to Multimedia**

- 1.1 Multimedia Foundation and Concepts
- 1.2 Multimedia Hardware, Multimedia Software
- 1.3 Multimedia Operating systems, Multimedia communication system

UNIT 2: Basic Compression Techniques

- 2.1 Video and Audio Data Compression Techniques – Lossy and Lossless
- 2.2 Example algorithms /standards Huffman, RLE, JPEG, MPEG, MP3, MP4, LZMA, FLAC, ALAC, ITU G.722, H.261, H.265

UNIT 3: Content Development and Distribution

- 3.1 Desktop publishing (Coral Draw, Photoshop, Page maker)
- 3.2 Multimedia Animation & Special effects (2D/3D animation, Flash)

UNIT 4: Introduction to Digital Imaging

- 4.1 Basics of Graphic Design and use of Digital technology
- 4.2 Definition of Digital images
- 4.3 Digital imaging in multimedia

UNIT 5: Introduction to Multimedia Programming and Applications

- 5.1 What is Multimedia Programming
- 5.2 Programming Languages for Multimedia Programming
- 5.3 Applications of Multimedia Programming

SUGGESTED LAB WORK:

This is a skill course. Topics/tools taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should explore features of various tools introduced during the course and become comfortable with their use.

Teacher should give weekly tasks as assignment.

REFERENCE BOOKS:

1. An Introduction to Multimedia Authoring, A. Eliens
2. Fundamentals of Multimedia, Prentice Hall/Pearson, Ze-Nian Li & Mark S. Drew.
3. Multimedia and Animation, V.K. Jain, Khanna Publishing House, Edition 2018
4. Fundamentals of Multimedia, Ramesh Bangia, Khanna Book Publishing Co., N. Delhi (2007)

SOFTWARE TESTING

Course Code	CS 60012(Same as IT 60012)
Course Title	Software Testing
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	CS 4004
Course Category	PE

COURSE LEARNING OBJECTIVES:

Essential software testing knowledge and skills, required to reasonably test a system under Development in a systematic manner.

COURSE OUTCOMES:

Student will develop skills to understand the system, choose suitable testing methods, strategies, tools and technology, execute and report the test. Student will also be able to understand need and usage of test automation and gain expertise in at least 1 test automation tool

COURSE CONTENTS:

As per the course design, concepts learned in this course will/should be used in the major project (Proj.202).

UNIT 1: Basics

- 1.1 Introduction to Software Quality basics
 - 1.1.1 Verification and validation
 - 1.1.2 quality perspectives
- 1.2 Testing terminology
- 1.3 Software Testing Life Cycle (STLC)
- 1.4 “V” model of Testing,
- 1.5 QA process, cost of testing, types of tests

UNIT 2: Writing Test Cases

- 2.1 Writing test cases
- 2.2 Functional Testing, non-functional testing, (Performance testing), UI testing.
- 2.3 Preparing test data, Writing Unit test, Integration test and User Acceptance Tests
- 2.4 Preparing test scenarios from Software requirements

UNIT 3: Test Execution and Management

- 3.1 Test execution
- 3.2 Test Oracles
- 3.3 Test planning, test strategy including when to stop testing
- 3.4 test-coverage- Traceability matrix, JIRA, Bugzilla and other bug tracking tools.
- 3.5 Test data mining
- 3.6 Test reporting.

UNIT 4: Test Automation

- 4.1 Why automation
- 4.2 when not to automate
- 4.3 writing simple automated test cases,
- 4.4 learn and practice any one automated testing framework like Selenium

UNIT 5: Other quality Assurance

- 5.1 Quality and Defect management - Code reviews,
- 5.2 Quality tools
- 5.3 Change management
- 5.4 Version control

SUGGESTED LAB WORK:

Writing and executing test cases of different types for a sample system, may be for the minor project done earlier; using Bugzilla to report cases; writing performance test cases for different types of test (load, stress, benchmarking, etc.); Writing automated test for UI, writing-executing test scripts for a sample system.

REFERENCE BOOKS/RESOURCES:

1. Software Engineering – A Practitioner’s Approach, 7th Edition, Roger Pressman.

2. Bugzilla (<https://www.bugzilla.org/>)
3. JIRA (<https://www.atlassian.com/software/jira>)

SEMESTER SCHEME-2020-21

MULTIMEDIA TECHNOLOGIES LAB

Course Code	CS 60021
Course Title	Multimedia Technologies Lab
Number of Credits	1(L: -, T: 0, P: 2)
Prerequisites	CS 3002, CS 4002, CS 4004
Course Category	PE

COURSE LEARNING OBJECTIVES:

To introduce students to the domain of Multimedia Technologies, which explain the technologies underlying digital images, videos and audio contents, including various compression techniques and standards, and the issues to deliver multimedia content over the Internet.

COURSE OUTCOMES:

Student will understand various aspects of Multimedia and related standards. Student will be able to build multimedia content and applications and also multimedia enable Web applications and mobile applications.

COURSE CONTENTS:

This is a skill course. Topics/tools taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should explore features of various tools introduced during the course and become comfortable with their use.

Teacher should give weekly tasks as assignment.

REFERENCE BOOKS:

5. An Introduction to Multimedia Authoring, A. Eliens
6. Fundamentals of Multimedia, Prentice Hall/Pearson, Ze-Nian Li & Mark S. Drew.
7. Multimedia and Animation, V.K. Jain, Khanna Publishing House, Edition 2018
8. Fundamentals of Multimedia, Ramesh Bangia, Khanna Book Publishing Co., N. Delhi (2007)

SOFTWARE TESTING LAB.

Course Code	CS 60022 (Same as IT 60022)
Course Title	Software Testing Lab
Number of Credits	1(L: -, T: 0, P: 2) Lab
Prerequisites	CS 4004
Course Category	PE

COURSE LEARNING OBJECTIVES:

Essential software testing knowledge and skills, required to reasonably test a system under Development in a systematic manner.

COURSE OUTCOMES:

Student will develop skills to understand the system, choose suitable testing methods, strategies, tools and technology, execute and report the test. Student will also be able to understand need and usage of test automation and gain expertise in at least 1 test automation tool

COURSE CONTENTS:

1. Test cases of different types for a sample system, may be for the minor project done earlier; using Bugzilla to report cases
2. Writing performance test cases for different types of test (load, stress, benchmarking, etc.)
3. Writing automated test for UI
4. Writing-executing test scripts for a sample system.

REFERENCE BOOKS/RESOURCES:

4. Software Engineering – A Practitioner’s Approach, 7th Edition, Roger Pressman.
5. Bugzilla (<https://www.bugzilla.org/>)
6. JIRA (<https://www.atlassian.com/software/jira>)
