OBJECTIVES:

- Identify and understand the working of key components of a computer system.
- Identify and understand the various kinds of input-output devices and different types of storage media commonly associated with a computer.
- Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure.
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in ‘C’ language.

INTENDED OUTCOMES:

- Write small programs related to simple/moderate mathematical and logical problems in ‘C’.
- Study, analyze and understand simple data structures and how to use it in C language.
- Identify and understand the working of different operating systems like windows and Linux etc.

UNIT I  OVERVIEW OF COMPUTER (8)

UNIT II  OVERVIEW OF ‘C’ (8)
Algorithms-Representation of Algorithms-Flowchart- Introduction to programming Languages-What is C- C Character set- Constants, Variables and Keywords-General form of C Program-The First C Program-Data types-Arithmetic Instructions- Type conversions- Relational and Logical Operators-Hierarchy and associativity.

UNIT III  SELECTION AND ITERATION (9)
Selection Structures- If and nested if - Loops-Definition and types-While loop-for loop- do-while loop-break and continue- Nested loops- Advantages of iteration-Menu driven programs-Switch Case.

UNIT IV  FUNCTIONS (10)
Functions- Definition-types-Functions without arguments- Functions with Input arguments- Functions with output parameters-local and global variables- advantages of functions- Call by value and Call by reference- Recursion- Function as an argument.

UNIT V  ARRAYS, STRINGS AND POINTERS (10)
Arrays-definition- Declaring and referencing arrays- Array initialization- Using for loops for accessing arrays-Passing array elements as function arguments-2D Array - Matrix Addition and multiplication-Introduction to Strings- declaration and Initialization--String constant -Strings as Array of Characters, Introduction to pointers-declaration and Initialization of pointers-basic pointer examples.

REFERENCES:

Total : 45

*This course is offered in the first semester to the branches CSE, EEE, ECE and in the second semester to the branches CIVIL, MECH and AUTO.
OBJECTIVE:

- To familiarize with open source office packages
- To write programs for Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings and Functions.

INTENDED OUTCOME:

- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in ‘C’ language

LIST OF EXPERIMENTS

1. Working with word Processing, Spreadsheet and presentation software in Linux

2. Programming in Scratch:
   Practicing fundamental concepts of programming like sequence, selection decision statements, working of loops and event driven programming

3. C Programming:
   Practicing programs to get exposure to basic data types, algebraic expressions, Conditional statements, Input and Output Formatting, Decision Statements, Switch Case, Control structures, arrays, Strings and function, implementation of pointers.

   Total Hours: 45

*This course is offered in the first semester to the branches CSE, EEE, ECE and in the second semester to the branches CIVIL, MECH and AUTO.
OBJECTIVE:

- Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in ‘C’ language

INTENDED OUTCOME:

- Understand the programming elements for solving computing related problems;
- Possess the ability to design and develop efficient computer programs for solving problems;
- Possess the ability to learn advanced programming techniques independently;
- Possess the ability to learn other high level programming languages independently;

UNIT-I POINTERS AND BUILT-IN-FUNCTIONS  
Introduction and features of pointers- Declaration of pointers- Void pointer- Array of pointers- Pointers to Pointers- Built-in-functions- String functions- Math functions- Character functions- Memory Management Functions- static and dynamic memory

UNIT-II STRUCTURES AND UNIONS  
Introduction and features of Structures- Declaration and initialization- Array of Structures- Pointers to structures- Passing structures as arguments to functions- Enumerated data type- typedef- Union

UNIT-III FILES  
Introduction- File operations- Open, read and close- Text modes- Binary modes- File functions- fprintf, fscanf, getc, putc, fgetc, fpUTC, fseek, feof- Command line arguments

UNIT-IV PREPROCESSOR DIRECTIVES  
The #define Statement- Program Extendability- Program Portability- The # Operator- The ## Operator- The #include Statement- System Include Files- conditional compilation- The #if, #endif, #else, #elif, ifndef Statements- #error, #line and #undef Statement

UNIT-V GRAPHICS IN C  
Graphics and Text mode- Video Adapter- Initialize Graphics Mode and resolution, graphics.h header file- Functions for drawing a Point on Screen, drawing lines, rectangle, circles, arcs, polygon- Functions to fill colors- Display Text in Graphics mode, outtext(), outtextxy(), justifying text.

Total: 45+15=60

REFERENCES:

4. How to solve it by Computer by R.J. Dromey, Prentice-Hall India EEE Series, 2012
OBJECTIVE:
- To understand the basic concept of C programming, and its different modules that includes Arrays, Strings, Functions, Pointers, Structures and File programming
- To understand the concept of Array and pointers dealing with memory management.
- To understand the concept of structures and unions through which derived data types can be formed.
- To learn graphics functions in C.

INTENDED OUTCOME:
- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, linking and executing a program using the development environment.
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs.
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.

LIST OF EXPERIMENTS
1. Implementing simple C program for practicing pointers
2. Implementation of Structures
3. Implementation of array of structures
4. Implementation of pointers to structures
5. Implementation of recursion in C
6. Implementing programs for Passing arrays and structures to functions
7. Implementation of memory management functions in C
8. Working with math and character built-in functions
9. Implementation of file functions
10. Working with preprocessor directives
11. Implementation of C program to practice graphics functions
Course Objectives:

- To acquire the knowledge needed to test the logic of a program.
- To gain knowledge in the applications of expert system, in data base.
- To provide adequate knowledge in class of functions, lattices, Number theory and graph theory.

Learning Outcomes:

- The student will gain the fundamentals about the logic of a programme.
- Enrichment of the knowledge in applications of expert system, in data base.
- Gaining the adequate concepts in class of functions, lattices, Number theory and graph theory.

UNIT- I  Set Theory and Functions  9


UNIT -II  Mathematical Logic  9


UNIT- III  Lattices and Boolean Algebra  9


UNIT -IV  Number Theory  9

Theory of Numbers – Prime – Composite – Perfect amicable numbers – The Sieve of Eratosthenes – Number of primes is infinite – Resolution of composite numbers in to prime factors – Divisor of a given number – Euler’s function \( \phi(N) \) – Highest power of prime \( p \) contained in \( n! \) – Congruence – Fermat’s theorem – Generalization of Fermat’s theorem – Wilson’s theorem – Lagrange’s theorem.
(Statements and simple problems only)

UNIT – V  Graph Theory  9


Total Hours: 45+15=60
Text Books:


References:

5. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, PHI Learning Pvt. Ltd., 2004

Websites:

1. www.mhhe.com/rosen
2. www.siam.org/books/series/dt.php
Course Objectives:

- Understand the properties of various data structures
- Identify the strengths and weaknesses of different data structures
- Design and employ appropriate data structures for solving computing problems
- Possess the knowledge of various existing algorithms
- Analyze and compare the efficiency of algorithms
- Possess the ability to design efficient algorithms for solving computing problems

Learning Outcomes:

- An understanding of the basic data structures.
- An understanding of the basic search and sort algorithms.
- The appropriate use of a particular data structure and algorithm to solve a problem.
- The ability to estimate big-O timings.

UNIT-1  Introduction to Data Structures and Algorithms  7
Arrays, Structures, Pointers to structures and Strings- Algorithm Development- Complexity Analysis- Recursion

UNIT-II  Linear Data Structures  9
Abstract Data Type(ADT)-Definition- List ADT – Linked List- Operations-Creation-Insertion-Deletion- Doubly Linked List- Stack ADT-Definition-Implementation - Operations and Applications-Queue ADT- Definition-Implementation, Operations and Applications

UNIT-III  Sorting and Searching  10
Bubble sort-Selection Sort-Insertion Sort-Merge Sort- Quick Sort- Running Time analysis of each sort – Linear Search-Binary Search-Hash Search Table

UNIT-IV  Non Linear Data Structures-I  10

UNIT-V  Non Linear Data Structures-II  9
Graph-Definition-Terminologies- Graph Representations- Graph Traversals- Basic Algorithms- Shortest Path Algorithm- Minimum Spanning Tree Construction Algorithms-Prim’s and Kruskal’s- Bi-connectivity- Graph Applications

Total Hours: 45+15=60

Text Books:

References:


Websites:

Course Objectives:

- To learn the basics of binary number systems, Boolean functions and their simplification using K-map.
- To study, analyse and design combinational logic circuits and synthesis of the combinational circuits using HDL.
- The design issues of MSI devices are taught in detail and their synthesis using HDL are learnt.
- To study, analyze and design sequential circuits.

Learning Outcomes:

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

- Perform arithmetic operations in any number system.
- Simplify the Boolean expression using K-Map and Tabulation techniques.
- Use Boolean simplification techniques to design a combinational hardware circuit.
- Design and analysis of a given digital circuit – combinational and sequential.
- Design a circuit using PLD

UNIT-I Number Systems

Binary, Octal, Decimal, Hexadecimal-Number base conversions – complements – signed Binary numbers.

UNIT-II Logic Gates And Combinational Circuits Logic Gates


UNIT-III Sequential Circuit

UNIT-IV  Asynchronous Sequential Circuits  


UNIT-V  Memory Devices


Total Hours: 45

Text Books:


References:


Websites:

Course Objectives:

- Understand the concepts of object-oriented, event driven, and concurrent programming paradigms
- Develop skills in using these paradigms using Java.
- Analyze and compare the efficiency of algorithms
- Possess the ability to design efficient algorithms for solving computing problems

Learning Outcomes:

- Able to use a simple Java programming environment, compile programs and interpret compiler errors.
- Able to understand and use the fundamental data types.
- Able to develop a program from a given design.
- Able to design classes and organise them into packages.
- Able to test programs to ensure that they perform as intended

UNIT I Fundamentals of Object-Oriented Programming

Object oriented programming concepts – Benefits of OOP-Applications of OOP- How Java Differs from C and C++- Java and Internet-Java and World Wide Web-Web Browsers-Hardware and Software Requirements-Java Support Systems-Java Environment

UNIT II Overview of Java Language

Simple Java Program-An Application with Two Classes-Java Program Structure-Java Tokens-Java Statements-Installing and Configuring Java-Implementing a Java Program-Java Virtual Machine-Command Line Arguments-Programming Style

UNIT III Constants, Variables, and Data Types


UNIT IV Branching and Looping


UNIT V Classes, Objects and Methods

Defining a Class-Creating Objects-Accessing Class Members-Constructors-Methods Overloading-Static Members-Nesting of Methods-Inheritance: Extending a Class-Overriding Methods-Final Variables and Methods-Final Classes-Finalizer Methods-Visibility Control-Arrays-Strings-Vectors

Total Hours: 45
Text Books:


References:


Websites:

3. www.learncpp.com/
Course Objectives:

- An understanding of basic EE abstractions on which analysis and design of electrical and electronic circuits and systems are based, including lumped circuit, digital and operational amplifier abstractions.
- The capability to use abstractions to analyze and design simple electronic circuits.
- The ability to formulate and solve the differential equations describing time behavior of circuits containing energy storage elements.
- An understanding of how complex devices such as semiconductor diodes and field-effect transistors are modeled and how the models are used in the design and analysis of useful circuits.
- The capability to design and construct circuits, take measurements of circuit behavior and performance, compare with predicted circuit models and explain discrepancies.

Learning Outcomes:

The students shall develop an intuitive understanding of the circuit analysis, basic concepts of electrical machines, transformers and be able to apply them in practical situation.

UNIT I Electric Circuits & Measurements 9


UNIT II Electrical Machines 9


UNIT III Measuring Instruments 9

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT IV Semiconductor Devices And Applications 9


UNIT V Digital Electronics 9

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

Total Hours: 45
**Text Books:**


**References:**

Course Objectives:

- A competence to design, write, compile, test and execute straightforward programs using a high level language;
- An appreciation of the principles of object oriented programming;
- An awareness of the need for a professional approach to design and the importance of good documentation to the finished programs.
- Be able to implement, compile, test and run Java programs comprising more than one class, to address a particular software problem.
- Demonstrate the ability to use simple data structures like arrays in a Java program.

Learning Outcomes:

- Understand the principles of OOP;
- Be able to demonstrate good object-oriented programming skills in Java;
- Understand the capabilities and limitations of Java;
- Be able to describe, recognise, apply and implement selected design patterns in Java;
- Be familiar with common errors in Java and its associated libraries.

List of Experiments

1. Create Java package with simple stack and queue class
2. Write a Java program to perform Complex number manipulation
3. Write a Java program for Date class similar to java.util package
4. Write a Java program for implementing dynamic polymorphism in java
5. Write a Java program for ADT stack using Java interface
6. Write a Java program for DNA file creation
7. Develop a simple paint like program using applet
8. Develop a scientific calculator using java
9. Developing a template for linked list
10. Develop a multi threaded producer consumer Application
11. Write a Java program for generating prime numbers and Fibonacci series
12. Write a Java program for Multithreaded GUI application

Total Hours: 45
Course Objectives:

- To learn and understand basic digital design techniques.
- To learn and understand design and construction of combinational and sequential circuits.
- To understand the digital logic and create various systems by using these logics.

Learning Outcomes

- Able to analyze and design digital combinational circuits like decoders, encoders, multiplexers, and de-multiplexers including arithmetic circuits (half adder, full adder, multiplier).
- Able to analyze sequential digital circuits like flip-flops, registers, counters.
- Understand the importance and need for verification, testing of digital logic and design for testability.

List of Experiments

1. Verification of Boolean theorems using digital logic gates
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters, etc.
3. Design and implementation of 4-bit binary adder / subtractor using basic gates and MSI devices
4. Design and implementation of parity generator / checker using basic gates and MSI devices
5. Design and implementation of magnitude comparator
6. Design and implementation of application using multiplexers
7. Design and implementation of Shift registers
8. Design and implementation of Synchronous and Asynchronous counters
9. Coding combinational circuits using Hardware Description Language (HDL software required)
10. Coding sequential circuits using HDL (HDL software required)

Total Hours: 45
Course Objectives:

- Analyze performance of algorithms.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Determine which algorithm or data structure to use in different scenarios.
- Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs.
- Use various data structures effectively in application programs.
- Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, heap sort and quick sort.
- Understand and apply fundamental algorithmic problems including Tree traversals, Graph traversals, and shortest paths.
- Program multiple file programs in a manner that allows for reusability of code.

Learning Outcomes:

- Able to understand the importance of structure and abstract data type, and their basic usability in different applications through different programming languages.
- Able to analyze and differentiate different algorithms based on their time complexity.
- Able to understand the linked implementation, and its uses both in linear and non-linear data structure.
- Able to understand various data structure such as stacks, queues, trees, graphs, etc. to solve various computing problems.

List of Experiments

1. Implementation of List using Arrays
2. Implementation of Singly Linked List
3. Implementation of Linked Stack
4. Implementation of Linked Queue
5. Implementation of any two stack applications
6. Implementation of Insertion Sort
7. Implementation of Merge Sort
8. Implementation of Quick Sort
9. Implementation of Insertion operation in Binary Search Tree
10. Implementation of Tree Traversals
11. Implementation of Hashing with any one collision resolution method
12. Implementation of Dijkstra’s Shortest Path Algorithm

Total Hours: 45
Course Objectives:

- Understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- Learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram.
- Know the fundamental concepts of transaction processing - concurrency control techniques and recovery procedure.
- Possess the knowledge about the emerging trends in the area of distributed DB- OO DB- Data mining and Data Warehousing and XML.

Learning Outcomes:

On successful completion of this module, the student should:

- Have gained knowledge and understanding of what is involved in the design of a database.
- Have gained knowledge and understanding of the models used for structuring data in database systems.
- Be able to implement a database and report on the process.
- Be able to query a database.

UNIT-I Introduction and Conceptual Modeling


UNIT-II Relational Model

SQL – Data definition - Queries in SQL - Updates - Views – Integrity and Security – Relational Database design - Relational Models - Design issues – Functional dependences and Normalization for Relational Databases (up to BCNF).

UNIT- III Data Storage and Query Processing


UNIT- IV Transaction Management

UNIT- V  Current Trends


Total Hours: 45 +15 =60

Text Books:


References:


Websites:

Course Objectives:

- To discuss the basic structure of a digital computer and to study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.
- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study in detail the different types of control and the concept of pipelining.

Learning outcomes:

The main goal of the course is for students to:

- Be able to understand simple circuits from logic formula.
- Understand the basics of assembly language.
- Understand the main concepts of computer architecture.
- Be able to explain how the various parts of a modern computer function and cooperate.
- Be able to exploit the advantages of an advanced computer memory having virtual memory and cache.
- Implement assembly programs that accomplish basic computational and I/O operations.

UNIT-I  Basic structure of computers
9
Functional units - Basic operational concepts - Bus structures - Software performance – Memory locations and addresses – Memory operations – Instruction and instruction sequencing – Addressing modes – Assembly language – Basic I/O operations – Stacks and queues.

UNIT- II Arithmetic unit
9
Addition and subtraction of signed numbers – Design of fast adders – Multiplication of positive numbers - Signed operand multiplication and fast multiplication – Integer division – Floating point numbers and operations.

UNIT- III Basic processing unit
9

UNIT- IV Memory system and i/o organization
9
UNIT- V  **Multiprocessor architecture**

Forms of Parallel Processing: Array Processors-Multiprocessors-Interconnection Networks : Single Bus- Crossbar Networks Multistage Networks-Hypercube Networks Mesh Networks-Tree Networks Ring Networks-Memory Organization in Multiprocessors- Program Parallelism and Shared Variables- Performance Consideration: Amdahl’s Law –Performance Indicators-Intel connection structure, intel connection arbitration

**Total Hours: 45**

**Text Books:**


**References:**


**Websites:**

1. www.eastaughs.fsnet.co.uk/cpu/structure-alu.htm
Course Objectives:

- To have an understanding of foundations of design of assemblers, loaders, linkers, and macro processors
- To understand the relationship between system software and machine architecture.
- To know the design and implementation of assemblers
- To know the design and implementation of linkers and loaders.
- To have an understanding of macro processors.

Learning Outcomes:

- Learns programming in assembly language, including its relationship to computer architecture, macros, segmentation, memory management, linkages, etc.

UNIT-I  Introduction

System software and machine architecture – The Simplified Instructional Computer (SIC) - XE - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming.

UNIT-II  Assemblers


UNIT-III  Loaders and Linkers


UNIT-IV  Macro Processors

Basic Operating System Functions-Machine Dependent Operating System Features: Interrupt Processing-
Process Scheduling-I/O Supervision- Machine Independent Operating System Features: File Processing,
Operating System Design Options: Multiprocessor Operating Systems-Distributed Operating Systems-
Object Oriented Operating Systems. Text editors - Editor Structure. - Interactive debugging systems

**Total Hours: 45**

**Text Books:**

   Education Asia.3rd edition, 2011

**References:**

   Delhi, 2009

**Websites:**

2. www.tenouk.com/ModuleW.html
Course Objectives:

- Understand the concepts of object-oriented, event driven, and concurrent programming paradigms
- Develop skills in using these paradigms using Java.

Learning Outcomes:

To be able to describe & discuss advanced features of Java programming including:

- concurrent object-oriented programming in Java
- event-driven programming
- event handling in the context of Java GUI programming

UNIT I  Interfaces and Packages

Defining Interfaces-Extending Interfaces-Implementing Interfaces-Accessing Interface Variables-Java API Packages-Using System Packages-Naming Conventions-Creating Packages-Accessing a Package-Using a Package-Adding a Class to a Package-Hiding Classes-Static Import

UNIT II  Multithreaded Programming

Creating Threads-Extending the Thread Class-Stopping and Blocking a Thread-Life Cycle of a Thread-Using Thread Methods-Thread Exceptions-Thread Priority-Synchronization

UNIT III  Managing Errors and Exceptions

Implementing the ‘Runnable’ Interface-Inter thread Communication-Types of Errors-Exceptions-Syntax of Exception Handling Code-Multiple Catch Statements-Using Finally Statement-Throwing Our Own Exceptions-Using Exceptions for Debugging

UNIT IV  Applet and Graphics


UNIT V  Managing Input/output Files in Java

Concept of Streams-Stream Classes-Byte Stream Classes-Character Stream Classes-Using Streams-Other Useful I/O Classes-Using the File Class-Input/Output Exceptions-Creation of Files-Reading/Writing Characters-Reading/Writing Bytes-Handling Primitive Data Types-Concatenating and Buffering Files-Random Access Files-Interactive Input and Output-Other Streamclasses

Total Hours: 45+15=60
Text Books:


References:


Websites:

Course Objectives:

- To create analytical skills, to enable the students to design algorithms for various applications, and to analyze the algorithms
- To introduce basic concepts of algorithms
- To introduce mathematical aspects and analysis of algorithms
- To introduce sorting and searching algorithms

Learning Outcomes:

The main goal of the course is for students to:

- prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.
- apply the algorithms and design techniques to solve problems
- analyze the complexities of various problems in different domains.

UNIT- I Basic Concepts of Algorithms


UNIT- II Mathematical Aspects and Analysis of Algorithms


UNIT- III Analysis of Sorting and Searching Algorithms


UNIT- IV Algorithmic Techniques


UNIT- V Algorithm Design Methods


Total Hours: 45
Text Books:


References:


Websites:

3. www.tsp.gatech.edu
Course Objectives:

- Understand the concepts of object-oriented, event driven, and concurrent programming paradigms.
- Develop skills in using these paradigms using Java.

Learning Outcomes:

After completion of this course, the students would be able to

- Understand programming language concepts, particularly Java and object-oriented concepts.
- Write, debug, and document well-structured Java applications.
- Implement Java classes from specifications.
- Effectively create and use objects from predefined class libraries.
- Understand the behavior of primitive data types, object references, and arrays.
- Apply decision and iteration control structures to implement algorithms.
- Implement interfaces, inheritance, and polymorphism as programming techniques.
- Apply exceptions handling.

List of Experiments

1. Write a Java program for generating prime numbers and Fibonacci series
2. Write a Java program for finding greatest number among 3 numbers in java
3. Write a Java program for Overloading in Java
4. Write a Java program for Overriding in Java
5. Write a Java program for Exception Handling
6. Write a Java program for Multithreading
7. Write a Java program to show the connectivity with JDBC
8. Write a Java program for Overloading in eclipse
9. Write a Java program to implement Jtable
10. Write a program of an applet that receives two numerical values as the input from user and displays the sum of these two numbers.

Total Hours: 45
Course Objectives:

- To introduce the scientific computing, covering some important aspects of solving algebraic equations, IVP, BVP.
- To implement the methods using the spread sheet in Excel

Learning Outcomes:

After completion of this course, the students would be able to

- To do the scientific computing to solving algebraic equations, IVP, BVP and also implement the methods using the spread sheet in Excel.

List of Experiments

1. Finding solution of Transcendental equation
   i) Newton – Raphson Method
   ii) Bisection method
   iii) Iterative method by reducing the equation to the form \( x = f(x) \)
2. Finding the dominant eigenvalue and eigenvector by power method
3. Numerical integration
   i) Gauss 2 point and 3 point formulae
   ii) Trapezoidal method
   iii) Simpson’s 1/3 rule
4. Solution of initial value problems governed by ODE
   i) Runge - Kutta 4th order method
   ii) Modified Euler’s method
   iii) Milne’s method
   iv) Adam – Bashforth method
5. Solution of BVP governed by PDE
   i) Laplace Equation
   ii) One – dimensional heat equation
     a) Explicit method : Bender – Schmidt’s method
     b) Implicit method : Crank - Nicolson’s method
   iii) One dimensional wave equation
     Implicit method

Total Hours: 45

Reference Books:

Course Objectives:
- Master the basic concepts and appreciate the applications of database systems.
- Master the basics of SQL and construct queries using SQL.
- Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.
- Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.
- Master sound design principles for logical design of databases, including the E-R method and normalization approach.
- Master the basics of query evaluation techniques and query optimization.

Learning Outcomes:
After completion of this course, the students would be able to

- Understand, appreciate and effectively explain the underlying concepts of database technologies
- Design and implement a database schema for a given problem-domain
- Normalize a database
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS
- Programming PL/SQL including stored procedures, stored functions, cursors, packages.
- Design and build a GUI application.

List of Experiments
1. Data Definition Language (DDL) commands in RDBMS.
2. Data Manipulation Language (DML) and Data Control Language (DCL) commands in RDBMS.
3. High-level language extension with Cursors.
4. High level language extension with Triggers.
5. Procedures and Functions.
6. Embedded SQL.
7. Database design using E-R model and Normalization.
8. Design and implementation of Payroll Processing System.
9. Design and implementation of Banking System.
10. Design and implementation of Library Information System.
11. Database connectivity using JDBC
12. Database connectivity using ODBC

Total Hours: 45
Course Objectives:
- To have a thorough knowledge of processes, scheduling concepts, memory management, I/O and file systems in an operating system
- To have an overview of different types of operating systems
- To know the components of an operating system.
- To have a thorough knowledge of process management
- To have a thorough knowledge of storage management
- To know the concepts of I/O and file systems.

LEARNING OUTCOMES:
- Understand device and I/O management functions in operating systems as part of a uniform device abstraction.
- Have an understanding of disk organization and file system structure.
- Be able to give the rationale for virtual memory abstractions in operating systems.
- Understand the main principles and techniques used to implement processes and threads as well as the different algorithms for process scheduling.
- Understand the main mechanisms used for inter-process communication.
- Understand the main problems related to concurrency and the different synchronization mechanisms available.

UNIT- I Introduction

UNIT –II Scheduling

UNIT- III Deadlocks

UNIT- IV Virtual Memory

UNIT- V File Systems

Total Hours: 45
Text Books:

References:

Websites:
2. www.ee.surrey.ac.uk/Teaching/Unix/
Course Objectives:
- To introduce the architecture and programming of 8085 microprocessor.
- To introduce the interfacing of peripheral devices with 8085 microprocessor.
- To introduce the architecture and programming of 8086 microprocessor.
- To introduce the architecture, programming and interfacing of 8051 microcontroller.

Learning outcomes:
This course is designed to introduce the basic concepts of Microprocessor and Microcontroller and provide an understanding of the basic concepts of various Interfacing and Applications. The course also helps the students to develop the ability to designing a programming for various applications.

UNIT I Microprocessor- 8086

UNIT II Programming of 8086
Addressing Modes - Instruction format - Instruction set - Assembly language programs in 8086. RISC architecture – introduction to ARM Programming - register configuration and instruction set – sample program.

UNIT III Interfacing Devices
Programmable Peripheral Interface (8255) - Programmable Interval Timer (8254) - Programmable Interrupt Controller (8259A) - Programmable DMA Controller (8257) - Programmable Communication Interface (8251A) – Programmable Keyboard and Display Controller (8279).

UNIT IV Microcontroller-8051

UNIT V Programming And Interfacing Of 8051
Timer - Serial Communication - Interrupts Programming - Interfacing to External Memory - Interfacing to ADC, LCD, DAC, Keyboard and stepper motor.

Total Hours: 45
Text Books:


References:

2. Krishna Kant, Microprocessor and Microcontroller Architecture, Programming and System Design using 8085, 8086, 8051 and 8096, PHI, New Delhi, 2008
4. Barry B. Brey, The Intel Microprocessors Architecture, Programming and Interfacing,
5. Pearson Education, New Delhi, 2007

Websites:

Course Objectives:
- Understand the division of network functionalities into layers.
- Be familiar with the components required to build different types of networks
- Be exposed to the required functionality at each layer
- Learn the flow control and congestion control algorithms

Learning Outcomes:
- To introduce the concepts, terminologies and technologies used in modern data communication and computer networking.
- To understand the concepts of data communications.
- To study the functions of different layers.
- To introduce IEEE standards employed in computer networking

UNIT- I  Fundamentals & Link layer
Building a network - ISO / OSI model - Requirements - Layering and protocols - Internet Architecture - Network software - Performance; Link layer Services - Framing - Error Detection - Flow control

UNIT –II  Media access & Internetworking
Media access control - Ethernet (802.3) - Wireless LANs - 802.11 - Bluetooth - Switching and bridging - Basic Internetworking (IP, CIDR, ARP, DHCP,ICMP)

UNIT –III  Routing
Routing (RIP, OSPF, metrics) - Switch basics - Global Internet (Areas, BGP, IPv6), Multicast - addresses - multicast routing (DVMRP, PIM)

UNIT- IV  Transport layer
Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission - TCP Congestion control - Congestion avoidance (DECbit, RED) - QoS - Application requirements

UNIT –V  Application layer
Traditional applications - Electronic Mail (SMTP, POP3, IMAP, MIME) - HTTP - Web Services - DNS – SNMP

Total Hours: 45+15=60

Text Books:

References:
Websites:

Course Objectives:

- To have an introductory knowledge of automata, formal language theory and computability.
- To have an understanding of finite state and pushdown automata.
- To have a knowledge of regular languages and context free languages.
- To know the relation between regular language, context free language and corresponding recognizers.
- To study the Turing machine and classes of problems.

Learning Outcomes:

- To have a introductory knowledge of automata, formal language theory and computability.
- To have an understanding of finite state and pushdown automata.
- To have a knowledge of regular languages and context free languages.
- To know the relation between regular language, context free language and corresponding recognizers.
- To study the Turing machine and classes of problems.

UNIT- I  Introduction To Automata  9

Basics of String and Alphabets - Finite Automata (FA) – Deterministic Finite Automata (DFA)– Non-deterministic Finite Automata (NFA) – Conversion of NFA to DFA- Finite Automata with Epsilon transition-Equivalence and Minimization of Automata

UNIT- II  Regular Expressions And Languages  9

Regular Expression – FA and Regular Expressions – Proving languages not to be regular –Pumping lemma for regular sets - Closure properties of regular languages- Decision Properties of Regular Languages

UNIT- III  Context-Free Grammar And Languages  9


UNIT IV  Properties Of Context Free Grammar  9

Normal forms for Context Free Grammar- Chomsky Normal Form- The Pumping lemma for Context free Languages- Closure properties of Context Free Languages-Inverse Homomorphism-Decision Properties of CFL

UNIT- V  Turing Machine  9

Turing Machines – Introduction- Definition – Turing machine construction- Storage in Finite control- Multiple tracks- Subroutines-Checking of Symbols – Two way infinite tape-Undecidability.

Total Hours: 45+15=60
Text Books:


References:


Websites:

Course Objectives:

- Understand fundamental underlying principles of computer networking
- Understand details and functionality of layered network architecture
- Apply mathematical foundations to solve computational problems in computer networking
- Utilizing Network tools and simulator

Learning Outcomes:

- Understands computer networking concepts and vocabulary
- Understands the concept of protocols
- Has received experience with real implementations of the concepts

List of Experiments

1. Implementation of Sliding Window Protocol.
2. Study of Socket Programming and Client - Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands
5. Create a socket for HTTP for web page upload and download.
6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting.
8. Applications using TCP Sockets like Echo client and echo server
9. Applications using TCP and UDP Sockets like File Transfer
10. Study of Network simulator (NS3), Wireshark

Total Hours: 45
Course Objectives:

The student should be made to:
- Introduce ALP concepts and features
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors

Learning Outcomes

- Ability to write a program for 8085 Microprocessor
- Ability to write a program for 8086 Microprocessor
- Ability to determine the program for Interfacing
- Ability to write a program for 8051 Microcontroller

List of Experiments

Minimum 12 Experiments to be conducted

1. Programs for 8/16 bit Arithmetic operations (Using 8086).
2. Programs for Sorting and Searching (Using 8086).
3. Programs for String manipulation operations (Using 8086).
4. Programs for Digital clock and Stop watch (Using 8086).
5. Programs on Subroutines (Using 8086)
6. Interfacing ADC and DAC(Using 8085).
7. 8255 PPI.
8. Transfer data serially between two kits (8253/8251).
9. 8279 Keyboard & display
10. Temperature control.
11. Traffic Control.
12. 8259 Programmable Interrupt Controller.
13. Interfacing and Programming of DC Motor Speed control (8085/8051)
15. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.

Total Hours: 45
Course Objective:

- Grasp a fundamental understanding of computer and operating systems
- Learn basic shell programming
- Understand memory management
- Understand process concurrency and synchronization
- Learn the scheduling policies of operating systems

Learning outcomes:

- Identify the services provided by operating system
- Understand the internal structure of an operating system and be able to write programs
- Understand and solve problems involving key concepts and theories in operating systems

List of Experiments

(Implement the following on LINUX platform. Use C for high level language implementation)

1. Shell programming
   - command syntax
   - write simple functions
   - basic tests
2. Shell programming
   - loops
   - patterns
   - expansions
   - substitutions
3. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
5. Write C programs to simulate UNIX commands like ls, grep, etc.
6. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time
7. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time
8. Implement the Producer – Consumer problem using semaphores.
9. Implement some memory management schemes – I
10. Implement some memory management schemes – II
11. Case study: “awk” Scripting Language

Total Hours: 45
15BECC601  Engineering Economics and Financial Management  L  T  P  C

3   0   0   3

Course Objectives:

- To know the fundamentals of cost analysis and economics.
- To learn about the basics of economics and cost analysis related to engineering so as to take economically sound decisions.
- To make the students to understand capital market, breakeven point analysis and depreciation

Learning Outcomes:

- Understand financial statements and cost information
- Understand the concept of the time value of money
- Understand money and its management
- Apply present worth analysis in evaluating alternatives apply annual worth analysis in evaluating alternatives
- Apply rate of return analysis in evaluating alternatives

UNIT- I  Fundamentals of Engineering Economics  9


UNIT- II  Financial Management  9


UNIT- III  Capital Market  9


UNIT- IV  New Economic Environment  9


UNIT- V  Cost Analysis And Break Even Analysis  9


Total Hours: 45
Text Books:


References:


Websites:

1. http://www.handbook.unsw.edu.au/postgraduate/courses/.../CVEN9701.ht...
Course Objectives:

- To introduce the methodologies involved in the development and maintenance of software over its entire life cycle.
- To be aware of Different life cycle models and requirement dictation process

Learning Outcomes:

- Plan and deliver an effective software engineering process, based on knowledge of widely used development lifecycle models.
- Employ group working skills including general organization, planning and time management and inter-group negotiation.
- Translate a requirements specification into an implementable design, following a structured and organised process.
- Formulate a testing strategy for a software system, employing techniques such as unit testing, test driven development and functional testing.
- Evaluate the quality of the requirements, analysis and design work done during the module.

UNIT - I  Software Process


UNIT - II  Software Requirements


UNIT- III  Design Concepts and Principles


UNIT- IV  Testing


**Total Hours: 45+15=60**

**Text Books:**


**References:**


**Websites:**

Course objectives:

- At the end of the course the student will be able to design and implement a simple compiler.
- To understand, design and implement a lexical analyzer.
- To understand, design and implement a parser.
- To understand, design code generation schemes

Learning Outcomes:
To be able to:

- build lexical analyzers and use them in the construction of parsers;
- express the grammar of a programming language;
- build syntax analyzers and use them in the construction of parsers;
- perform the operations of semantic analysis;
- discuss the merits of different optimization schemes.

UNIT- I  Introduction to compiling 9


UNIT- II  Syntax Analysis 9


UNIT –III  Intermediate code generation 9


UNIT- IV  Code generation 9


UNIT- V  Code optimization and run time environments 9


Total Hours: 45+15=60
Text Books:


References:


Websites:

2. http://www.mactech.com/articles/mactech/Vol.06/06.04/LexicalAnalysis/index.html
Course Objectives:

The objectives of the course are to:

- Practicing the different types of case tools such as Rational Rose / other Open Source to be used for all the phases of Software development life cycle.

Learning Outcomes:

- The students understands the process to be followed in the software development life cycle

List of Experiments

1. Implementation of Student Marks Analyzing System
2. Implementation of Quiz System
3. Implementation of Online Ticket Reservation System
4. Implementation of Payroll System
5. Implementation of Course Registration System
6. Implementation of Expert Systems
7. Implementation of ATM Systems
8. Implementation of Stock Maintenance

Total Hours: 45
Course Objectives:

- To develop managerial and entrepreneurial skills our Culture and Ethics
- Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations.
- After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling.
- To create an awareness and practice through Engineering Ethics and Human Values.

Intended Outcomes:

- Advanced philosophical knowledge of the profession of recreation and leisure
- Synthesis of trends and issues as related to current professional practice
- Evaluation of organizational theories and human resource management principles
- Information Competency
- Ethical practices and Ethical Management

UNIT I  Management, Planning, Organizing 9


UNIT II  Directing and Controlling 9


UNIT III  Engineering Ethics 9


UNIT IV  Factors of Changes 9

Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws. Social changes – Meaning and nature – Theories.

UNIT V  Entrepreneurship and Motivation 9


Total Hours: 45
Text Books:


References:

2. Charles E Harris, Michael S. Protchard and Michael J Rabins,” Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Learning, United States, 2009

Websites:

Course Objectives:

- To learn the basic web concepts and Internet protocols.
- To understand CGI Concepts & CGI Programming.
- To familiarize with Scripting Languages.
- To study DHTML, XML, SERVELETS AND JSP.

Intended Outcomes:

- Demonstrate an understanding of the components of a computer information networked system, including application and software, communication protocols, and networking hardware and software.
- Create, install and update sophisticated web sites.
- Install and manage server software and other server side tools.
- Demonstrate critical thinking in the understanding, evaluation and application of technology solutions to a variety of real-life situations.
- Articulate ethical and professional standards as they apply to the use of the computer systems and computer based data.

UNIT I         Introduction


UNIT II       Common gateway interface programming


UNIT III      Scripting languages


UNIT IV       Dynamic HTML


UNIT V        Servlets and JSP

JSP Technology Introduction-JSP and Servelets- Running JSP Applications Basic JSP- JavaBeans Classes and JSP-Tag Libraries and Files- Support for the Model-View- Controller Paradigm- Case Study- Related Technologies.

Total Hours: 45+15=60
Text Books:


References:


Websites:

2. www.comptechdoc.org/independent/web/
15BECS703  Open Source Software

Course Objectives:

- To understand concepts, strategies, and methodologies related to open source software development.
- To understand the business, economy, societal and intellectual property issues of open source software.
- To familiar with open source software products and development tools currently available on the market.
- Be able to utilize open source software for developing a variety of software applications, particularly Web applications.

Intended Outcomes:

- Understanding of the issues and currents in open source and open source development
- Having the ability to choose between the various open source licenses understanding the implications for users, developers, and the software community in general
- Able to develop projects in python
- Have a basic understanding of HTML5 and how to develop modern web enabled applications
- Able to develop projects in PHP and MySQL
- Write software that integrates and interacts with existing open source systems (e.g., Firefox). For example: add-ons; bug fixes; new features; etc.

UNIT I  Introduction to OSS and Unix OS

Overview of Free/Open Source Software-- Definition of FOSS & GNU, Advantages of Free Software and GNU/Linux, FOSS usage, trends and potential - global and Indian. GNU/Linux OS installation - detect hardware, configure disk partitions & file systems and install a GNU/Linux distribution; Basic shell commands - logging in, listing files, editing files, copying/moving files, viewing file contents, changing file modes and permissions, process management; User and group management, file ownerships and permissions.

UNIT II  Python Overview


UNIT III  Python


UNIT IV  PHP

Introduction to PHP - Evaluation of Php - Basic Syntax - Defining variable and constant - Php Data type - Operator and Expression - Handling Html Form With Php - Decisions and loop - Function- Generating Images with PHP - Database Connectivity with MySql

Total Hours: 45

Text Books:

2. Rasmus Lerdorf and Levin Tatroe, “Programming PHP”, O’Reilly, 2002

References:


Websites:

2. php.net/docs.php
5. https://docs.python.org/3/library/
7. dev.mysql.com/doc/en/
8. https://www.mysql.com/...mysql/.../mysql-web-reference-architectures-f...
Course Objectives:

- To understand concepts, strategies, and methodologies related to open source software development.
- To familiar with open source software products and development tools currently available on the market.
- Be able to utilize open source software for developing a variety of software applications, particularly Web applications.

Intended Outcomes:

- Having the ability to choose between the various open source licenses understanding the implications for users, developers, and the software community in general
- Able to develop projects in python
- Have a basic understanding of HTML5 and how to develop modern web enabled applications
- Able to develop projects in PHP and MySQL
- Write software that integrates and interacts with existing open source systems (e.g., Firefox). For example: add-ons; bug fixes; new features; etc.

List of Experiments

1. Linux operating system installation
2. Working basic commands in Unix.
3. Simple programs to practice condition and input and output statements using Python.
4. Working with Strings in Python
5. Programming in python- program to perform functions in List & Tuple
6. Programming in python- working with Loops
7. Installation of Mysql and working with MySQL queries
8. Database connectivity with PHP and Mysql

Total Hours: 45
Course Objectives:

- To learn the basic web concepts and Internet protocols.
- To develop web page using HTML
- To familiarize with Scripting Languages.
- To study DHTML, XML, SERVELETS AND JSP.

Intended Outcomes:

- Create, install and update sophisticated web sites.
- Install and manage server software and other server side tools.
- Articulate ethical and professional standards as they apply to the use of the computer systems and computer based data.

List of Experiments

1. Develop a web page using HTML with containing map with hot spots that hyperlinks to related information.
2. Develop a web page and use various CSS formatting options on the text.
3. Develop a web page and use external CSS formatting with different formatting options than the ones’ used in the previous experiment.
4. Develop a XSL parser for an XML document for data display.
5. Using CSS to format an XML Document
6. Develop a mechanism to validate user input at the client side using JavaScript.
7. Program to set a cookie using JavaScript
8. Develop a computer program that utilizes Java Applet technology to demonstrate some functions.
9. Developing a Java Applet that utilizes the Sound function and is included in the HTML document
10. Develop a mini web application of your choosing.

Total Hours: 45
Course Objectives:

- Describe those aspects of mobile programming that make it unique from programming for other platforms,
- Critique mobile applications on their design pros and cons,
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
- Program mobile applications for the Android operating system that use basic and advanced phone features, and
- Deploy applications to the Android marketplace for distribution.

Intended Outcomes:

- Ability to install Android in Eclipse
- Understanding of the Android environment to develop projects
- Ability to develop simple Android projects
- Understanding of the android widgets and inclusion of it in projects
- Ability to create android application for playing audio and video files

List of Experiments

2. Creating and Running Android Virtual Device (AVD)
3. Running Hello World Android Project
4. Working with different Android User Interface
5. A simple android application to study various android widgets like text box, buttons, toggle Buttons and Images
6. Working with Android Activity life cycle
7. Working with intents
8. Working with fragments
9. Working with TTS engine in Android
10. A simple android application for playing audio and video files

Total Hours: 45
COMPUTER SCIENCE AND ENGINEERING
DEPARTMENT ELECTIVE
Course Objectives:

- To arm the students with the basic programming concepts.
- To introduce different techniques pertaining problem solving skills.
- To arm the students with the necessary constructs of C++ programming.
- To emphasis on guided practical sessions.

Learning Outcomes:

- Articulate the principles of object-oriented problem solving and programming.
- Outline the essential features and elements of the C++ programming language.
- Explain programming fundamentals, including statement and control flow and recursion.
- Apply the concepts of class, method, constructor, instance, data abstraction, function abstraction, inheritance, overriding, overloading, and polymorphism.
- Program with basic data structures using array, list, and linked structures.

UNIT I Introduction to C++

Object Oriented Programming Paradigms - Comparison of Programming Paradigms – Object Oriented Languages - Benefits of Object Oriented Programming - Comparison with C - Overview of C++ - Pointers - References and Structures - Functions - Scope and Namespaces - Source Files and Programs.

UNIT II Classes and Objects

Working with classes – Classes and objects – Class specification-Class objects - Accessing class members- Defining class members - Inline functions - Accessing member functions within class - Data hiding - Class member accessibility - Empty classes, constructors - Parameterized constructors - Constructor overloading - Copy constructors - new, delete operators - “this” pointer - friend classes and friend functions - Function overloading - Operator overloading.

UNIT III Derived Classes

Base class and derived class relationship - Derived class declaration - Forms of inheritance - Inheritance and member accessibility - Constructors in derived class - Destructors in derived class - Multiple inheritance - Multi level inheritance - Hybrid inheritance - Virtual base classes - Member function overriding - Virtual functions.

UNIT IV I/O and Library Organization

UNIT V Object Oriented Design


Total Hours: 45

Text Books:


References:

Course Objectives:

- Understand and describe current and emerging database models and technologies.
- Design and implement relational database solutions for general applications.
- Develop database scripts for data manipulation and database administration.
- Understand and perform common database administration tasks, such as database monitoring, performance tuning, data transfer, and security.
- Understand the concepts and practices of data warehouse and OLAP.

Learning Outcomes:

- Able to understand the background and knowledge of some advanced topics in database that have become key techniques in modern database theory and practices; typical topics are distributed concurrency control, database recovery, query optimization, spatial databases.
- Able to understand the background and knowledge of some contemporary topics in database research; typical topics are data mining, uncertainty data management, XML data.
- Able to understand the background and knowledge of some contemporary topics in information management, typical topics are cloud computing, web information management, social network technology.

UNIT I  Relational Model Issues


UNIT II  Distributed Databases


UNIT III  Object Oriented Databases


UNIT IV  Emerging Systems


UNIT V  Current Issues


Total Hours: 45
Text Books:


References:

Course Objectives:

- To extend the students' knowledge of algorithms and data structures, and to enhance their expertise in algorithmic analysis and algorithm design techniques.
- Expected to learn a variety of useful algorithms and techniques and able to apply those algorithms and techniques to solve problems.

Learning Outcomes:

- Solve problems using the procedural, functional, and object-oriented programming paradigms.
- Differentiate amongst the classic algorithms and data structures.
- Evaluate contemporary legal, social, and ethical issues in computing professions.

UNIT I  Fundamentals  9


UNIT II  Heap Structures  9


UNIT III  Trees  9


UNIT IV  Set & Graph Algorithms  9

Set ADT- Union & Find data structure and Applications- Graph traversals-DFS, BFS, Bi connected components, Cut vertices, Graph Matching, Network flow Problems

UNIT V  Geometric Algorithms  9


Total Hours: 45

Text Books:

References:

Course Objectives:

- To do an advanced study of the Instruction Set Architecture, Instruction Level Parallelism with hardware and software approaches, Memory and I/O systems and different multiprocessor architectures with an analysis of their performance.
- To study the ISA design, instruction pipelining and performance related issues.
- To do a detailed study of ILP with dynamic approaches.
- To do a detailed study of ILP with software approaches.
- To study the different multiprocessor architectures and related issues.
- To study the Memory and I/O systems and their performance issues.

Learning Outcomes:

- To design and construct application specific solutions in the field of computer architecture.
- To appreciate that the solution to any problem in computer architecture is likely to be quickly invalidated by time and to strive for solutions that minimize the effects of this reality.
- To develop confidence in specifying computational requirements and formulating original solutions in a timely manner.

UNIT I     Pipelining and ILP


UNIT II    Advanced Techniques for Exploiting ILP


UNIT III   Multiprocessors


UNIT IV    Multi-Core Architectures

UNIT V Memory Hierarchy Design

Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

Total Hours: 45

Text books:


References:

Course Objectives:

- Encryption techniques and key generation techniques
- Authentication and security measures
- Intrusion and filtering analysis

Learning Outcomes:
The main goal of the course is for students to:

- Identify some of the factors driving the need for network security.
- Identify and classify particular examples of attacks.
- Identify physical points of vulnerability in simple networks.
- Describe methods of providing assurances about data integrity.
- Describe and distinguish between different mechanisms to assure the freshness of a message.
- Discuss the effectiveness of passwords in access control and the influence of human behavior.

UNIT I  Conventional and Modern Encryption


UNIT II  Public Key Encryption

Number Theory – Prime number – Modular arithmetic – Euclid’s algorithm – Fermet’s and Euler’s theorem – Primality – Chinese remainder theorem – Discrete logarithm – Public key cryptography and RSA – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve cryptography

UNIT III  Authentication


UNIT IV  Security Practice

Authentication applications – Kerberos – X.509 Authentication services - E-mail security – IP security - Web security

UNIT V  System Security

Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security

Total Hours: 45
Text Books:


References:

Course Objectives:

- To understand the basic concepts in distributing computing in operating systems
- To enable the students to involve in research activities in recent trends
- To make the students to get idea of distributed operating systems

Learning Outcomes:

The main goal of the course is for students to:

- Identify the differences among: concurrent, networked, distributed, and mobile.
- Understand Resource allocation and deadlock detection and avoidance techniques.
- Understand Remote procedure calls.
- Understand IPC mechanisms in distributed systems.
- Design and build newer distributed file systems for any OS.

UNIT I    Fundamentals


UNIT II    Remote Procedure Calls


UNIT III    Distributed Shared Memory


UNIT IV    Synchronization and Management


UNIT V    Distributed File Systems


Total Hours: 45
Text Books:


References:

Course Objectives:
- To cover the fundamental concepts of the C# language and the .NET framework.
- The student will gain knowledge in the concepts of the .NET framework as a whole and the technologies that constitute the framework.
- The student will gain programming skills in C# both in basic and advanced levels.
- By building sample applications, the student will get experience and be ready for large-scale projects.

Learning Outcomes:
The main goal of the course is for students to:
- Write clear and effective C# code.
- Access data using ADO.NET
- Develop web applications using ASP.NET Web Forms.
- Develop and use ASP.NET Web Services.

UNIT I  Introduction


UNIT II  Assemblies


UNIT III  Interfaces and Collections


UNIT IV  IO Namespace and ADO .NET


**Text Books:**

**References:**
Course Objectives:
- Apply analog and digital communication techniques.
- Learn data and pulse communication techniques.
- Be familiarized with source and Error control coding.
- Gain knowledge on multi-user radio communication.
- Use data and pulse communication techniques.
- Utilize multi-user radio communication.

Learning Outcomes:
- Demonstrate about various blocks in communication system.
- Analyze the types of modulations.
- Analyze and design the analog modulator and demodulator circuits.
- Analyze All Modulation techniques in time and frequency domains.

UNIT I  Analog Communication


UNIT II  Digital Communication


UNIT III  Data and Pulse Communication


UNIT IV  Source and Error Control Coding

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes, convolution codes, viterbi decoding algorithm

UNIT V  Multi-User Radio Communication

Advanced Mobile Phone System (AMPS) - Global System for Mobile Communications (GSM) - Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse - Channel Assignment and Hand off - Overview of Multiple Access Schemes - Satellite Communication - Bluetooth.

Total Hours: 45
Text Books:


References:

Course Objectives:

- To create in-depth awareness of packet routing in computer communication networks
- To provide comprehensive details of routing algorithms, protocols and architectures of routers followed by the concepts of MPLS towards the next generation routing

Learning Outcomes:

- To be able to explain basic network routing concepts and algorithms
- To be able to explain how the Internet protocol suite operates describe the functions of various protocols
- To be able to explain the concept and usage of node addressing classify addresses into network layers

UNIT I Introduction


UNIT II Internet Routing

Interior protocol : Routing Information Protocol (RIP), Open Shortest Path First(OSPF), Bellman Ford Distance Vector Routing. Exterior Routing Protocols: Exterior Gateway Protocol (EGP) and Border Gateway Protocol (BGP). Multicast Routing: Pros and cons of Multicast and Multiple Unicast Routing, Distance Vector Multicast Routing Protocol (DVMRP), Multicast Open Shortest Path First (MOSPF), MBONE, Core Based Tree Routing.

UNIT III Routing In Optical Wdm Networks

Classification of RWA algorithms, RWA algorithms, Fairness and Admission Control, Distributed Control Protocols, Permanent Routing and Wavelength Requirements,Wavelength Rerouting- Benefits and Issues, Lightpath Migration, Rerouting Schemes, Algorithms- AG, MWPG.

UNIT IV Mobile - IP Networks


UNIT V Mobile Ad –Hoc Networks

Internet-based mobile ad-hoc networking communication strategies, Routing algorithms – Proactive routing: destination sequenced Distance Vector Routing (DSDV), Reactive routing: Dynamic Source Routing (DSR), Ad hoc On-Demand Distance Vector Routing (AODV), Hybrid Routing: Zone Based Routing (ZRP).

Total Hours: 45
Text Books:


References:

Course Objectives:

- To serve as an introductory course to undergraduate students with an emphasis on the design aspects of Data Mining and Data Warehousing
- To introduce the concept of data mining with in detail coverage of basic tasks, metrics, issues, and implication. Core topics like classification, clustering and association rules are exhaustively dealt with.
- To introduce the concept of data warehousing with special emphasis on architecture and design.

Learning Outcomes:

- Understand why there is a need for data warehouse in addition to traditional operational database system
- Identify components in typical data warehouse architectures
- Understand why there is a need for data mining and in what ways it is different from traditional statistical techniques
- Understand the details of different algorithms
- Solve real data mining problems to find interesting patterns
- Understand a typical knowledge discovery process

UNIT - I   Introduction and Data Warehousing

Introduction, Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Implementation, Further Development, Data Warehousing to Data Mining

UNIT - II   Data Preprocessing, Language, Architectures, Concept Description

Why Preprocessing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces, Architectures, Concept Description, Data Generalization, Characterizations, Class Comparisons, Descriptive Statistical Measures.

UNIT - III   Association Rules

Association Rule Mining, Single-Dimensional Boolean Association Rules from Transactional Databases, Multi-Level Association Rules from Transactional Databases

UNIT - IV   Classification And Clustering

Classification and Prediction, Issues, Decision Tree Induction, Bayesian Classification, Association Rule Based, Other Classification Methods, Prediction, Classifier Accuracy, Cluster Analysis, Types of data, Categorization of methods, Partitioning methods, Outlier Analysis.

UNIT - V   Recent Trends

Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, World Wide Web, Applications and Trends in Data Mining

Total Hours: 45
Text Books:

1. J. Han, M. Kamber, Data Mining: Concepts and Techniques, Harcourt India / Morgan Kauffman, 3rd edition, 2011.
2. Sam Anahory, Dennis Murry, Data Warehousing in the real world, Pearson Education, 2007

References:

1. Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education 2006
2. David Hand, Heikki Manila, Padhraic Symth, Principles of Data Mining, PHI 2004
Course Objectives:

- To study the concept of menus, windows, interfaces.
- To study about business functions.
- To study the characteristics and components of windows.
- To study the various controls for the windows.
- To study about various problems in windows design with color, text, graphics
- To implement the basics and in-depth knowledge about UID. It enables the students to take up the design the user interface, design, menu creation and windows creation and connection between menu and windows.

Learning Outcomes:

- To demonstrate knowledge of some theories of design of user interfaces
- To demonstrate knowledge of different interaction styles
- To be able to analyze a user interface from a communication perspective
- To demonstrate an awareness of the relation between interaction design and users expectations

UNIT- I  Introduction  9

Introduction-Importance-Human-Computer interface-characteristics of graphics interface-Direct manipulation graphical system - web user interface-popularity-characteristic & principles.

UNIT- II  UI Design Process  9


UNIT- III  UI Controls  9


UNIT- IV  Web Page Designing  9


UNIT- V  UI Tests  9


Total Hours: 45
Text Books:


References:

Course Objectives:

- To make the students to understand the windows programming concepts including Microsoft Foundation Classes
- To introduce the concepts of windows programming
- To introduce GUI programming using Microsoft Foundation Classes
- To enable the students to develop programs and simple applications using Visual C++

Learning Outcomes:

- Use the different elements of a visual programming language as building blocks to develop correct, coherent programs.
- Analyze problems, develop conceptual designs that solve those problems, and transform those designs to Visual Programs.
- Program using the fundamental software development process, including design, coding, documentation, testing, and debugging.

UNIT I  Windows Programming

Windows environment – a simple windows program – windows and messages – creating the window – displaying the window – message loop – the window procedure – message processing – text output – painting and repainting – introduction to GDI – device context – basic drawing – child window controls - An introduction to Unicode - An architectural overview - processing the messages

UNIT II  Visual C++ Programming – Introduction


UNIT III  The Document And View Architecture

Menus – Keyboard accelerators – rich edit control – toolbars – status bars – reusable frame window base class – separating document from its view – reading and writing SDI and MDI documents – splitter window and multiple views – creating DLLs – dialog based applications - Virtual key code, CTOOLBar class, RC files

UNIT IV  Activex And Object Linking And Embedding (OLE)

Activex controls Vs. Ordinary Windows Controls – Installing Activex controls – Calendar Control – Activex control container programming – create Activex control at runtime – Component Object Model (COM) – containment and aggregation Vs. inheritance – OLE drag and drop – OLE embedded component and containers – Dialogue based applications – Writing simple dialog based programs
UNIT V  Advanced Concepts

Database Management with Microsoft ODBC – Structured Query Language – MFC ODBC classes – sample database applications – filter and sort strings – DAO concepts – displaying database records in scrolling view – Threading – Connecting visual C++ programs to remote database, M-strsort, M-strfilter variables

Total hours: 45

Text Books:


References:

Course Objectives:

- This unit gives an introduction to Ad-Hoc Wireless Networks, Issues, and Classification of MAC Protocols.
- This unit gives a detailed description of Different types of AdHoc Routing Protocols and TCP over AdHoc Protocol.
- This unit provides in-depth knowledge about Sensor Network Architecture, its Applications and MAC Protocols for sensor networks.
- This unit begins with a discussion of Different Issues in Wireless Sensor Routing. It also covers Indoor and outdoor Localization and Quality of Service in WSN.
- This unit emphasize on Necessity for Mesh Networks, IEEE 802.11s Architecture and different types of Mesh Networks

Learning Outcomes:

- Identify the basic problems, limitations, strengths and current trends of mobile computing
- Explain the current wireless networking mechanisms for mobile computing
- Analyse and critique the performance of different networks and algorithms for mobile Computing
- Develop an attitude to propose solutions with comparisons for problems related to mobile computing through investigation of different protocols and mobile/wireless networks

UNIT I Ad-Hoc MAC


UNIT II Ad-Hoc Network Routing & TCP


UNIT III WSN –MAC


UNIT IV WSN Routing, Localization & QOS


UNIT V Mesh Networks


Total Hours: 45
Text Books:


References:

Course Objectives:

- To analyze the components of cloud computing and its business perspective.
- To evaluate the various cloud development tools.
- To collaborate with real time cloud services.
- To analyze the case studies to derive the best practice model to apply when developing and deploying cloud based applications.

Learning Outcomes:

- Understand and appreciate the technological impact of service and cloud computing for future enterprises, and the technologies underpinning it.
- Apply systematic and principled practices to designing, implementing and deploying service and cloud-oriented computing.
- Review and assess the risks, opportunities, costs and steps towards migrating existing systems to service and cloud computing.

UNIT - I  Cloud Introduction  9


UNIT-II  Cloud Services and File System  9

Types of Cloud services: Software as a Service - Platform as a Service – Infrastructure as a Service - Database as a Service - Monitoring as a Service – Communication as services. Service providers - Google App Engine, Amazon EC2, Microsoft Azure, Sales force. Introduction to MapReduce, GFS, HDFS, Hadoop Framework.

UNIT-III  Collaborating with Cloud  9


UNIT-IV  Virtualization for Cloud  9

Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM, VMWare, Virtual Box, Hyper-V.

UNIT-V  Security, Standards, and Applications  9


Total Hours: 45
Text Books:


References:

Course Objectives:

- Artificial Intelligence aims at developing computer applications, which encompasses perception, reasoning and learning and to provide an in-depth understanding of major techniques used to simulate intelligence.
- To provide a strong foundation of fundamental concepts in Artificial Intelligence
- To provide a basic exposition to the goals and methods of Artificial Intelligence
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning.

Learning Outcomes:

- Understand the history, development and various applications of artificial intelligence
- Familiarize with propositional and predicate logic and their roles in logic programming;
- Understand the programming language Prolog and write programs in declarative programming style;
- Learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems;
- Appreciate how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory and possibility theory (fuzzy logic);

UNIT I  Introduction and Problem Solving  9


UNIT II  Informed Search and Game Playing  9


UNIT III  Knowledge and Reasoning  9


UNIT IV  Acting Logically  9

UNIT V Learning and Communication


Total hours: 45

Text Books:

References:
Course Objectives:

- To make students understand the principles of software testing
- To explain the basics of software testing
- To highlight the strategies for software testing
- To stress the need and conduct of testing levels
- To identify the issues in testing management
- To bring out the ways and means of controlling and monitoring testing activity

Learning Outcomes:

- Understand and apply the principal approaches to software testing, together with their associated techniques.
- Plan, analyse, design, implement, execute and evaluate the testing of a software component or system intended to implement a given software specification.
- Apply test automation techniques and testing tools in support of test execution and evaluation.
- Apply appropriate international standards for test documentation

UNIT- I  Introduction


UNIT -II  Test Case Design


UNIT-III  Levels of Testing

The Need for Levels of Testing- Unit Test- Unit Test Planning- Designing the Unit Tests- The Class as a Testable Unit- The Test Harness- Running the Unit tests and Recording results-Integration tests-Designing Integration Tests- Integration Test Planning- System Test – The Different Types-Regression Testing- Alpha- Beta and Acceptance Tests

UNIT- IV  Test Management

Defining Terms- Measurements and Milestones for Controlling and Monitoring- Status Meetings- Reports and Control Issues- Criteria for Test Completion- SCM- Types of reviews- Developing a review program- Components of Review Plans- Reporting review results

Total Hours: 45

Text Books:


References:

Course Objectives:

- To explore the fundamental concepts of big data analytics
- To learn to analyze the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to use various techniques for mining data stream.
- To understand the applications using Map Reduce Concepts.

Intended Outcomes

- Understanding of Big Data and Hadoop ecosystem
- Understanding fundamentals of Hadoop ecosystem and NoSQL technologies
- Working with Hadoop Distributed File System (HDFS)
- Ability to write MapReduce programs and implementing HBase
- Ability to write Hive and Pig scripts

UNIT I Introduction to Big Data


UNIT II Mining Data Streams


UNIT III Hadoop

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

UNIT IV Hadoop Environment

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive–fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Visualizations–Visual data analysis techniques, interaction techniques; Systems and applications.

Total Hours: 45

Text Books:


References:

Course Objectives:

- To understand the concepts of sensor networks
- To learn how to program sensor motes
- To understand the challenging issues in each layer of sensor networks

Learning Outcomes:

- Apply knowledge of wireless sensor networks to various application areas.
- Ability to Design, implement and maintain wireless sensor networks.
- Ability to formulate and solve problems creatively.

UNIT I  Fundamentals of Sensor Networks  9

Introduction and Overview - Overview of sensor network protocols, architecture, and applications, Challenges, Main features of WSNs; Research issues and trends, Platforms- Standards and specifications-IEEE802.15.4/Zigbee, Hardware: Telosb, Micaz motes, Software: Overview of Embedded operating systems-Tiny OS, Introduction to Simulation tools- TOSSIM, OPNET, Ns-2.

UNIT II  Communication Characteristics and Deployment Mechanisms  9

Wireless Communication characteristics - Link quality, fading effects, Shadowing, Localization, Connectivity and Topology - Sensor deployment mechanisms, Coverage issues, Node discovery protocols.

UNIT III  Mac Layer  9

Fundamentals of Medium access protocol- Medium access layer protocols - Energy efficiency, Power allocation and Medium access control issues.

UNIT IV  Network Layer and Transport Layer  9


UNIT V  Middleware and Security Issues  9

Middleware and Application layer -Data dissemination, Data storage, Query processing, Security - Privacy issues, Attacks and Countermeasures

Total Hours :45
Text Books:


References:

Course Objectives:

- The students will be able to interpret the contributions of human factors and technical constraints on human-computer interaction. Evaluate the role of current HCI theories in the design of software.
- Apply HCI techniques and methods to the design of software.
- Categorize and carefully differentiate various aspects of multimedia interfaces.
- Design and develop issues related to HCI for real application.

Learning Outcomes:

- Understand key aspects of human psychology which can determine user actions at satisfaction of the interface.
- Describe the key design principles for user interfaces.
- Set up and carry out a process to gather requirements for, engage in iterative design of, and evaluate the usability of a user interface.
- Describe how user interface development can be integrated into an overall software development process.
- Understanding of the ethical issues involved in testing user interfaces.

UNIT I  Design Process


UNIT II  Design and Evaluation of Interactive Systems


UNIT III  Models


UNIT IV  Experimental Design and Statistical Analysis of HCI


**Total Hours: 45**

**Text Books:**


**References:**

Course Objectives:

- To facilitate the understanding of Quality Management principles and process.
- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

Learning Outcomes:

- Understand the fundamental principles of Total Quality Management;
- Choose appropriate statistical techniques for improving processes;
- Write reports to management describing processes and recommending ways to improve them;
- Develop research skills that will allow them to keep abreast of changes in the field of Total Quality Management;
- Emphasis the process of learning and discovery rather than the presentation of fact.

UNIT I Introduction 9


UNIT II Tqm Principles 9

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III Tqm Tools and Techniques I 9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV Tqm Tools and Techniques II 9


UNIT V Quality Systems 9


Total Hours - 45
Text Books:


References:

Course Objectives:

- Understand the advanced concepts of wireless mobile networks
- Apply transactions for complex model
- Explore the modern design structures of pervasive computing
- Analyze various advanced mobile network models

Learning Outcomes:
Upon the completion of this course given in the curriculum, students should be able to

- Outline the basic problems, performance requirements of pervasive computing applications and the trends of pervasive computing and its impacts on future computing applications and society.
- Analyze and compare the performance of different data dissemination techniques and algorithms for mobile real-time applications
- Analyze the performance of different sensor data management and routing algorithms for sensor networks.
- Develop an attitude to propose solutions with comparisons for problems related to pervasive computing system through investigation.

UNIT I  Introduction to Mobile Computing  9

Mobility of bits and bytes – Wireless the beginning – Mobile computing- Dialogue control-Networks – Middleware and gateways- Application and services- Developing mobile computing applications-Security- Standards- Players in wireless space- Architecture for mobile computing-Three tier architecture- Design considerations-Mobile computing through internet-Making existing applications mobile enabled-Developing IVR application.

UNIT II  Mobile Technologies  9


UNIT III  Mobile Networking Wireless  9


UNIT IV  Introduction to Pervasive Computing  9


Total Hours - 45

Text Books:


References:

Course Objectives:

- Develop resource description framework data
- Work with SPARQL queries
- Familiar with the applications of semantic web technology

Learning Outcomes:

- Show an understanding of the basic principles of different theoretical models of distributed knowledge-based systems, and assess their applicability to specific knowledge-sharing tasks.
- Describe the motivations for, and effectiveness of, inference techniques in the implementation of distributed knowledge-based systems.
- Critically assess the adequacy of relevant standards (WSDL, RDF, OWL, etc) as a basis for building practical systems.
- Demonstrate an understanding of how the architecture and design of distributed knowledge-based systems interacts with wider social and technological developments.

UNIT I  Introduction


UNIT II  Rdf and Querying the Semantic Web

RDF data model-synaxes-Adding semantics-RDF schema-RDF and RDF schema in RDF schema-An axiomatic semantics for RDF and RDF schema-Querying the semantic web-SPARQL-Basics-Filters-Constructs-Organizing result sets-Querying schemas.

UNIT III  Ontology


UNIT IV  Logic and Inference


UNIT V  Applications of Semantic Web Technologies

Good relations-BBC artists-BBC world cup 2010 website-Government data, Newyork times-Sigma and sindiceopen Calais-schema.org-Future of semantic web

Total Hours - 45
Text Books:


References:

Course Objectives:

- Identify the data structures for Unix Kernel.
- Describe the methods for managing a Buffer Cache.
- Illustrate the concept of Inter Process Communication
- Implement the various system calls for Unix OS.

Learning Outcomes

Upon successful completion of this course, students will be able to

- Look up information using man pages.
- Use a debugger and a program profiler; benchmark program execution and identify both critical and dead code.
- Write C programs that use UNIX system calls and behave as Unix commands and filters.
- Use structures to pass information and document structures using labelled diagrams.
- Set up callback routines such as those used in handling signals.
- Create a C program and a script that interprets command line options.
- Develop test data and test scripts.

UNIT I  Kernel Data Structures and Buffer Cache  9


UNIT II  Files and System Calls for File System  9

Inode- Structure of a regular File- Directories-Conversion of pathname to an Inode- Super block – Inode assignment to a file- System calls for File System. Allocation of Disk blocks

UNIT III  Process Structure and Control Structure of a Process  9


UNIT IV  Process Scheduling and Memory Management Policies  9

Process Scheduling: Scheduling-System calls for time and clock. Memory Management: Swapping – Demand Paging.

UNIT V  Drivers and Inter Process Communication  9


Total Hours - 45
Text Books:


References:

Course Objectives:

- To gain understanding of the basic principles of service orientation
- To learn service oriented analysis techniques
- To learn technology underlying the service design
- To learn advanced concepts such as service composition, orchestration and Choreography
- To know about various WS-* specification standards

Learning Outcomes:

Upon successful completion of this course, students will be able to

- Look up information using man pages.
- Use a debugger and a program profiler; benchmark program execution and identify both critical and dead code.
- Write C programs that use UNIX system calls and behave as Unix commands and filters.
- Use structures to pass information and document structures using labelled diagrams.
- Set up callback routines such as those used in handling signals.
- Create a C program and a script that interprets command line options.
- Develop test data and test scripts.

UNIT I  Introduction


UNIT II  Services

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration – Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer

UNIT III  Analysis


UNIT IV  SOA

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE)
WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WS- Security

**Total Hours: 45**

**Text Books:**


**References:**

Course Objectives:

- To understand software metrics and measurement.
- To emphasize the use of product and quality metrics.
- To explain quality assurance and various tools used in quality management.
- To learn in detail about various quality assurance models.
- To understand the audit and assessment procedures to achieve quality.

Learning Outcomes:

- Identify the fundamental issues that a project manager has to consider, and describe, chiefly in the context of software development projects, what approaches exist to manage these issues.
- Identify and analyze software project activities using contemporary work breakdown techniques.
- Identify and apply selected techniques for estimating the effort and duration of project activities.
- Construct a schedule of project activities using contemporary planning techniques.
- Construct a quality model for a software development project, including identification of suitable quality attributes, suitable metrics for measuring these, and suitable threshold values for these metrics to indicate acceptable quality.

UNIT I  Software Process and People Management

Process Maturity – Capability Maturity Model (CMM) – Variations in CMM - Productivity improvement process. Organization structure – Difficulties in people management - Effective team building – Role of Project manager - Team structures – Comparison of different team structures.

UNIT II  Software Metrics

Role of metrics in software development - Project metrics – Process metrics – Data gathering - Analysis of Data for measuring correctness, integrity, reliability and maintainability of Software products.

UNIT III  Project Management


UNIT IV  Risk Management

Risk analysis and management - Types of Risk involved - RMM plan.
UNIT V  Project Scheduling and Tracking Software Configuration Management


**Total Hours: 45**

**Text Books:**


**References:**

Course Objectives:

- Evaluate storage architectures and key data center elements in classic, virtualized and cloud environments
- Explain physical and logical components of a storage infrastructure including storage subsystems, RAID and intelligent storage systems
- Describe storage networking technologies such as FC-SAN, IP-SAN, FCoE, NAS and object-based, and unified storage
- Understand and articulate business continuity solutions – backup and replications, along with archive for managing fixed content Explain key characteristics, services, deployment models, and infrastructure components for a cloud computing

Learning Outcomes:

- Describe and apply storage technologies
- Identify leading storage technologies that provide cost-effective IT solutions for medium to large scale businesses and data centers
- Describe important storage technologies" features such as availability, replication, scalability and performance
- Work in project teams to install, administer and upgrade popular storage solutions
- Identify and install current storage virtualization technologies
- Manage virtual servers and storage between remote locations
- Design, analyze and manage clusters of resources

UNIT I Storage System

Introduction to information storage, Virtualization and cloud computing, Key data center elements, Compute, application, and storage virtualization, Disk drive and flash drive components and performance, RAID, Intelligent storage system and storage provisioning (including virtual provisioning)

UNIT II Storage Networking Technologies and Virtualization

Fibre Channel SAN components, FC protocol and operations, Block level storage virtualization, iSCSI and FCIP as an IP-SAN solutions, Converged networking option – FCoE, Network Attached Storage (NAS) – components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.

UNIT III Backup, Archive and Replication

Business continuity terminologies, planning and solutions, Clustering and multipathing to avoid single points of failure, Backup and recovery – methods, targets and topologies, data deduplication and backup in virtualized environment, fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.
UNIT IV  Cloud Computing

Characteristics and benefits, Services and deployment models, Cloud infrastructure components, Cloud migration considerations.

UNIT V  Securing and Managing

Storage Infrastructure Security threats, and countermeasures in various domains, Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments, Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle Management (ILM) and storage tiering.

Total Hours:45

Text Books:


References:

2. Information Storage and Management: Storing, Managing, and Protecting Digital Information, EMC Education Services, Wiley, January 2010
Course Objectives:

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To know the aspects of risk management
- To study the critical need for ensuring Information Security in Organizations

Learning Outcomes:

- Learn to select appropriate techniques to tackle and solve problems in the discipline of information security management;
- Learn the importance of security and its management for any modern organization;
- Learn how an information security management system should be planned, documented, implemented and improved, according to the BSI standard on information security management.

UNIT I  Introduction


UNIT II  Security Investigation

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

UNIT III  Security Analysis

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

UNIT IV  Logical Design


UNIT V  Physical Design


Total Hours: 45
Text Books:


References:

Course Objectives:

- To provide the student with knowledge of various levels of analysis involved in NLP.
- To understand language modeling.
- To gain knowledge in automated natural language generation and machine translation.

Learning Outcomes:

- Compose key NLP elements to develop higher level processing chains
- Assess / Evaluate NLP based systems
- Choose appropriate solutions for solving typical NLP subproblems (tokenizing, tagging, parsing)
- Describe the typical problems and processing layers in NLP
- Analyze NLP problems to decompose them in adequate independent components

UNIT I  Overview and Language Modeling  8


UNIT II  Word Level and Syntactic Analysis  9


UNIT III  Semantic Analysis and Discourse Processing  10


UNIT IV  Natural Language Generation and Machine Translation  9


Text Books:


References:

OPEN ELECTIVES OFFERED BY COMPUTER SCIENCE AND ENGINEERING
Course Objectives:

- To learn how to use and manipulate several core data structures: Lists, Dictionaries, Tuples, and Strings.
- To understand the process and skills necessary to effectively deal with problem solving in relation to writing programs.
- To understand the process and skills necessary to effectively deal with problem solving in relation to writing programs.

UNIT I    Fundamentals

The Universal Machine-Program power- What is Computer Science?-Hardware Basics-Programming Languages-Python-Inside Python program-Software Development Process- Example program-Elements of programs- Output statements- Assignment Statements- Data types-Type conversions

UNIT II    Decision Structures and Loops

Simple Decisions-Two-way decisions-Multi-way decisions-Exception handling-for loops-indefinite loops-common loop patterns-Booleans

UNIT III    Functions

Function of functions-Functions and Parameters-Function that returns values-Function that modifies parameters-Functions and program structures

UNIT IV    Sequences

String data type- String Processing-List as sequences-String Representation-String Methods-I/O as String manipulation-File Processing

UNIT V    Objects and Graphics


Total Hours: 45

Text Books:


References:

Course Objectives:

- To introduce the Java programming language and explore its current strengths and weaknesses
- To study the way that object-oriented concepts are implemented in the Java programming language
- To write working Java code to demonstrate the use of applets for client side programming
- To study the way that exceptions are detected and handled in the Java programming language
- To write working Java code that demonstrates multiple threads of execution

UNIT I Introduction


UNIT II HTML


UNIT III PERL


UNIT IV Client-Server programming


UNIT V Internet Telephony


Total Hours: 45
Text Books:

References:
Course Objectives:

- Assemble/setup and upgrade personal computer systems
- Perform installation, configuration, and upgrading of microcomputer hardware and software.
- Install/connect associated peripherals.
- Diagnose and troubleshoot microcomputer systems hardware and software, and other peripheral equipment.

UNIT I Introduction


UNIT II Peripheral Devices


UNIT III PC Hardware Overview


UNIT IV Installation and Preventive Maintenance


UNIT V Troubleshooting


Total Hours: 45

Text Books:


References:

Course Objectives:

- To understand the basic history and genres of games
- To demonstrate an understanding of the overall game design process
- To explain the design tradeoffs inherent in game design
- To design and implement basic levels, models, and scripts for games
- To describe the mathematics and algorithms needed for game programming
- To design and implement a complete three-dimensional video game

UNIT I Introduction

Introducing Games with Java- Requirements-Installing Netbeans IDE-Structure of Java Program-Structure of Java GUI-Swing controls-Stopwatch Project-Creating Frames-Adding Controls-Adding Event methods-Writing Code

UNIT II Safecracker Project

Frame design-Grid Bag Layout Manager-Code Design-Adding Sounds-Tic Tac Toe Project-Frame Design-Code Design-Adding Events-Adding Sounds

UNIT III Match Game Project

Preview-Frame Design-Photo Selection-Code Design-Timer Objects- Adding Delays-one player Solitaire game-Computer Moves

UNIT IV Pizza Delivery Project

Preview- Frame Design-Adding Clock-Game Design-Multiple Frames GUI- Leap Frog Project-Preview-Frame Design-Code Design- Introduction to OOP-Sprite Class-Collision detection between objects- Updating Scores

UNIT V Moon Landing Project

Preview-Frame Design- Code Design- Graphics Methods- Graphics 2D Objects-Stroke and Paint Objects-Shapes and Drawing Methods-Line, Rectangle and Ellipse-Scrolling Background-Sprite Animation

Text Books:

1. Philip Conrod, Lou Tylee, “Programming Games with Java”, 2013

References:

2. Wayne Holder, Doug Bell, “Java Game Programming for Dummies”,
VALUE ADDED COURSES
Course Objectives:

- To demonstrate various principles involved in solving mathematical problems and adopt new and faster methods of calculations.

- To bring out behavioral changes among the trainees so that they develop interpersonal, communication, team building skills and leadership skills. It helps them in enhancing productivity and performance at the workplace. The training helps them to acquire employability skills so that they can get employment easily.

Module -1

Introduction, Speed Math’s, Problems on Numbers, Averages, Ratios and Proportions, Problems on Ages

Module – 2

Percentage, Data Interpretation, Profit and loss, Simple and Compound Interest

Module – 3

Time Speed and Distance, Time and Work, Pipes and Cistern, Geometry, Probability, Permutation and Combination

Module-4

Overview to communication, self Introduction, Presentation on their own topic, Extempore, Group Activity

Module -5

Group Discussion, Do's and Don’ts of Group Discussion, Body language, Grooming and Resume, Resume correction

Module -6

Introduction to HR, HR questions and Do's and Don’ts in HR, HR Interview, Mock GD & HR

Text books:
1. Quantitative Aptitude – Abhijit Guha
2. Quantitative Aptitude – R.S.Aggarwal
OPEN ELECTIVES
Department of Science & Humanities
COURSE OBJECTIVES:

- Be able to solve problems in different environments and develop critical thinking
- Be able to build and solve Transportation Models, Assignment Models, integer programming and Non linear programming

UNIT I  LINEAR PROGRAMMING PROBLEM (9)
Formulation of LPP - Graphical Method - Simplex Method - Artificial variable technique and two phase simplex method. Duality - Dual and simplex method - Dual Simplex Method.

UNIT II  TRANSPORTATION PROBLEM (9)
Transportation Model, finding initial basic feasible solutions, moving towards optimality, Degeneracy.

UNIT III  ASSIGNMENT PROBLEM (9)
Solution of an Assignment problem, Multiple Solution, Hungarian Algorithm, Maximization in Assignment Model, Impossible Assignment.

UNIT IV  INTEGER PROGRAMMING (9)
Integer Programming Problem – Gromory’s fractional cut Method – Branch Bound Method

UNIT V  NETWORK ANALYSIS (9)
PERT & CPM- network diagram-probability of achieving completion date- crash time- cost analysis.

Total : 45

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<td>Prentice – Hall of India Private Limited, New Delhi</td>
<td>2010</td>
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COURSE OBJECTIVES:

- Be able to design new simple models, like: CPM, MSPT to improve decision-making and develop critical thinking and objective analysis of decision problems.
- Be able to understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.
- Understand how to model and solve problems using dynamic programming.

UNIT – I INVENTORY MODELS
Economic order quantity models-techniques in inventory management-ABC analysis.

UNIT – II NON LINEAR PROGRAMMING
Khun-tucker conditions with non-negative constraints- Quadratic programming- Wolf's modified simplex method.

UNIT – III SIMULATION MODELS

UNIT -IV DECISION MODELS

UNIT -V REPLACEMENT MODELS
Models based on models that gradually deteriorate with time- whose maintenance cost increase with time- Replacement of items that fail suddenly and completely.

Total : 45

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<td>2010</td>
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<tr>
<td>2</td>
<td>Kanti Swarup, Manmohan, Gupta</td>
<td>Operations Research</td>
<td>Sultan Chand &amp; Sons</td>
<td>2008</td>
</tr>
</tbody>
</table>
### REFERENCES:

<table>
<thead>
<tr>
<th>S. No.</th>
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<th>Title of the book</th>
<th>Publisher</th>
<th>Year of Publication</th>
</tr>
</thead>
</table>

### WEBSITES:

1. www.mathcentre.ac.uk  
2. www.mathworld. Wolfram.com  
3. www.mit.edu
COURSE OBJECTIVES:

- To gain knowledge in measures of central tendency and probability.
- Acquire skills in handling situations involving more than one random variable and functions of random variables.
- To understand the knowledge of random process.

UNIT- I MEASURES OF CENTRAL TENDENCY AND PROBABILITY (9)

Measures of central tendency – Mean, Median, Mode - Standard Deviation
Probability - Random variable - Axioms of probability - Conditional probability - Total probability – Baye’s theorem.

UNIT- II STANDARD DISTRIBUTIONS (9)

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma(one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – Chebyshev's inequality.

UNIT –III TWO DIMENSIONAL RANDOM VARIABLES (9)

Joint distributions - Marginal and conditional distributions - Probability mass function - Probability density functions – Covariance - Correlation and regression

UNIT- IV CLASSIFICATION OF RANDOM PROCESS (9)

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT -V CORRELATION AND SPECTRAL DENSITIES (9)


Total : 45

TEXT BOOK:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Author(s) Name</th>
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</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Ross, S</td>
<td>A first Course in Probability</td>
<td>Pearson Education, New Delhi (Chap 2 to 8)</td>
<td>2002</td>
</tr>
</tbody>
</table>

# WEBSITES:

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld.Wolfram.com
COURSE OBJECTIVES:

- To gain knowledge in measures of central tendency and probability.
- Acquire skills in handling situations involving more than one random variable and functions of random variables.
- To understand the knowledge of testing hypotheses.

UNIT-I MEASURES OF CENTRAL TENDENCY AND PROBABILITY (12)

UNIT-II STANDARD DISTRIBUTIONS (12)
Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma, and Normal distributions - Moment generating functions, Characteristic function and their properties.

UNIT-III TWO DIMENSIONAL RANDOM VARIABLES (12)
Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

UNIT-IV TESTING OF HYPOTHESIS (12)
Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

UNIT-V DESIGN OF EXPERIMENTS (12)

Note: Use of approved statistical tables permitted in the examination.

Total : 45

TEXT BOOKS:

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Walpole, R.E., Myers, R.H., Myers, R.S.L and Ye, K</td>
<td>Probability and Statistics for Engineers and Scientists</td>
<td>Pearson Education, Delhi.</td>
<td>2002</td>
</tr>
<tr>
<td>3</td>
<td>Ross, S</td>
<td>A first Course in Probability (Chapters 2 to 8). New Delhi</td>
<td>Pearson Education, Delhi</td>
<td>2002</td>
</tr>
<tr>
<td>4</td>
<td>Johnson, R.A</td>
<td>Miller &amp; Freund's Probability and Statistics for Engineers (Chapters 7, 8, 9, 12)</td>
<td>Pearson Education, Delhi</td>
<td>2000</td>
</tr>
</tbody>
</table>

# WEBSITES:

2. www.mathcentre.ac.uk
3. www.mathworld.wolfram.com
COURSE OBJECTIVES:

- To understand the fundamental knowledge of probability theory.
- To acquire skills in handling situations involving more than one random variable and functions of random variables.
- To understand and characterize phenomena which evolve with respect to time in a probabilistic manner.

UNIT- I  PROBABILITY AND RANDOM VARIABLE  (9)
Axioms of probability - Conditional probability - Total probability – Baye’s theorem- Random variable - Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties.

UNIT- II  STANDARD DISTRIBUTIONS  (9)
Functions of a random variable - Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties.

UNIT- III  TWO DIMENSIONAL RANDOM VARIABLES  (9)
Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

UNIT -IV  RANDOM PROCESS AND MARKOV CHAINS  (9)

UNIT-V  QUEUEING THEORY  (9)
Markovian models - M/M/1, M/M/C, finite and infinite capacity - M/M/∞ queues - Finite source model - M/G/1 queue (steady state solutions only) - Pollaczek - Khintchine formula - Special cases.

Total : 45

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</thead>
</table>

**WEBSITES:**

1. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.mit.edu
COURSE OBJECTIVES:

- To know the fundamentals of fuzzy Algebra.
- To know the basic definitions of fuzzy theory
- To know the applications of fuzzy Technology.

UNIT I  FUZZY SETS  (9)

UNIT II  OPERATIONS ON FUZZY SETS  (9)
Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, t-conorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III  FUZZY RELATIONS  (9)
Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNIT IV  FUZZY MEASURES  (9)

UNIT V  FUZZY INFERENCE  (9)
Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

Total : 45

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</thead>
<tbody>
<tr>
<td>2</td>
<td>Kevin M Passino and Stephen Yurkovich</td>
<td>Fuzzy Control</td>
<td>Addison Wesley Longman</td>
<td>1998</td>
</tr>
<tr>
<td>3</td>
<td>Michal Baczynski and Balasubramaniam Jayaram</td>
<td>Fuzzy Implications</td>
<td>Springer Verlag, Heidelberg</td>
<td>2008</td>
</tr>
</tbody>
</table>
WEBSITES:

1. www.mathcentre.ac.uk
2. www.mathworld.wolfram.com
3. www.doc.ic.ac.uk
4. www.calvin.edu/~pribeiro/othrlinks/Fuzzy/fuzzysets.htm
COURSE OBJECTIVES:

- To know the fundamentals of Tensors.
- To know the series solutions to differential equations.
- To introduce the concepts of special functions.
- To study about Calculus of variations and integral equations

UNIT I TENSORS (8)
Definition of tensor - rank, symmetric tensors, contraction, quotient rule - tensors with zero components, tensor equations, metric tensors and their determinants - pseudo tensors

UNIT II DIFFERENTIAL EQUATIONS-SERIES SOLUTIONS (8)
Series Solution : Classification of singularities of an ordinary differential equation - Method of Frobenius - indicial equation - examples

UNIT III SPECIAL FUNCTIONS (8)
Basic properties (Recurrence and Orthogonality relations, series expansion) of Bessel, Legendre, Hermite and Laguerre functions – Generating Function

UNIT IV CALCULUS OF VARIATIONS (9)
Concept of variation and its properties – Euler’ s equation – Functional dependant on first and higher order derivatives – Functional dependant on functions of several independent variables – Variational problems with moving boundaries – Isoperimetric Problems – Direct methods – Ritz and Kantorovich methods.

UNIT V LINEAR INTEGRAL EQUATIONS (12)

Total : 45
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Author(s) Name</th>
<th>Title of the book</th>
<th>Publisher</th>
<th>Year of Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Grewal B.S.</td>
<td>Higher Engineering Mathematics</td>
<td>40\textsuperscript{th} edition, Khanna Publishers</td>
<td>2011</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:

- To introduce the concepts of special functions.
- To find the solutions to partial differential equations and their applications
- To know the transforms.
- To study about mathematical physics and perturbation techniques

UNIT I INTRODUCTION TO SOME SPECIAL FUNCTIONS
Gamma function, Beta function, Bessel function, Error function and complementary Error function, Heaviside’s function, pulse unit height and duration function, Sinusoidal Pulse function, Rectangle function, Gate function, Dirac’s Delta function, Signum function, Saw tooth wave function, Triangular wave function, Half wave rectified sinusoidal function, Full rectified sine wave, Square wave function.

UNIT II PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS
Formation PDEs, Solution of Partial Differential equations \( f(x,y,z,p,q) = 0 \), Nonlinear PDEs first order, Some standard forms of nonlinear PDE, Linear PDEs with constant coefficients, Equations reducible to Homogeneous linear form, Classification of second order linear PDEs. Separation of variables use of Fourier series, D’Alembert’s solution of the wave equation, Heat equation: Solution by Fourier series and Fourier integral

UNIT – III PERTURBATION TECHNIQUES

UNIT -IV SIMULATION MODELS

UNIT V DECISION MODELS

Total : 45
## REFERENCES:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Author(s) Name</th>
<th>Title of the book</th>
<th>Publisher</th>
<th>Year of Publication</th>
</tr>
</thead>
</table>
COURSE OBJECTIVES:

- To know the fundamentals of linear Algebra.
- To study about the linear transformations
- To introduce the concepts of inner product spaces

UNIT I VECTOR SPACES (9)
General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space.

UNIT II EIGEN VALUES AND EIGEN VECTORS (9)
Eigen values and Eigen vectors - Diagonalization - Power method – QR decomposition

UNIT III SYSTEM OF LINEAR EQUATIONS (9)

UNIT IV LINEAR TRANSFORMATIONS (9)
Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity – Eigenvalues and Eigenvectors Eigen values and Eigenvectors – Diagonalization

UNIT V INNER PRODUCT SPACES (9)
The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

Total : 45

REFERENCES:

<table>
<thead>
<tr>
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<th>Year of Publication</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>Anton and Rorres</td>
<td>Elementary Linear Algebra, Applications version</td>
<td>Wiley India Edition</td>
<td>2010</td>
</tr>
<tr>
<td>3</td>
<td>Jim Defranza, Daniel Gagliardi</td>
<td>Introduction to Linear Algebra with Application</td>
<td>Tata McGraw-Hill</td>
<td>2009</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:

- To develop the skills of the students in the areas of transforms and partial differential equations.
- To understand the applications of partial differential equations.

UNIT- I  FOURIER SERIES  (10)
Dirichle”s conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval’s identify – Harmonic Analysis.

UNIT -II  FOURIER TRANSFORM  (9)

UNIT- III  PARTIAL DIFFERENTIAL EQUATIONS  (9)
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange’s linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT- IV  APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS  (9)
Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT- V  Z -TRANSFORM AND DIFFERENCE EQUATIONS  (8)

TEXT BOOKS:

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<thead>
<tr>
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<th>Year of Publication</th>
</tr>
</thead>
</table>

### WEBSITES:

1. [www.sosmath.com](http://www.sosmath.com)
2. [http://mathworld.wolfram.com/FourierSeries.html](http://mathworld.wolfram.com/FourierSeries.html)
PURPOSE:

It provides techniques of writing and also trains the students to write without their influence of mother tongue. In addition to honing their skills as professional writers, students will develop technical vocabularies that will aid writing research articles and discussing articles produced by their peers.

COURSE OBJECTIVES:

- Develop abilities to write technically and expressively,
- Recognize writing as a constructive, meaningful process,
- Practice using reading strategies for effective writing.

UNIT – 1 BASICS OF WRITING (7)

Introduction to Technical Writing – Importance of Writing – Characteristics of Writing – Audience Recognition/ Analysis – Appropriateness of language — Conciseness and Flow – Bias free and plain writing – Impersonal and Formal Language -Techniques of Technical Writing – Overcoming writer’s block – Prioritizing for effective writing – Avoiding plagiarism.

UNIT – 2 PARAGRAPHS AND ESSAYS (9)


UNIT – 3 LETTERS, MEMOS AND EMAIL (9)


UNIT – 4 THE ART OF CONDENSATION AND TECHNICAL PROPOSALS (9)

UNIT – 5  REPORTS AND RESEARCH ARTICLES


Total Hours: 45

TEXT BOOKS:

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<tr>
<th>S.NO</th>
<th>AUTHOR(S) NAME</th>
<th>TITLE OF THE BOOK</th>
<th>PUBLISHER</th>
<th>YEAR OF PUBLICATION</th>
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<tbody>
<tr>
<td>1</td>
<td>V.N. Arora &amp;</td>
<td>Improve Your</td>
<td>OUP</td>
<td>2014</td>
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<tr>
<td></td>
<td>Lakshmi Chandra</td>
<td>Writing: Revised</td>
<td></td>
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<td></td>
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<td>First Edition</td>
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<th>YEAR OF PUBLICATION</th>
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<tbody>
<tr>
<td>1</td>
<td>Crème, P. and M. Lea.</td>
<td>Writing at University: A guide for students.</td>
<td>OUP</td>
<td>2003</td>
</tr>
<tr>
<td>2</td>
<td>Graham King</td>
<td>Collins Improve Your Writing</td>
<td>Collins; First edition</td>
<td>2009</td>
</tr>
<tr>
<td>3</td>
<td>David Morley</td>
<td>The Cambridge Intro. To Creative Writing</td>
<td>Cambridge</td>
<td>2008</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:

- To understand the solar system and earth structure
- To study about the Earthquake
- To understand the Physical Oceanography

UNIT I ORIGIN OF EARTH (9)

UNIT II STRUCTURE OF EARTH (9)
Chemical composition of Earth, Rheological behavior of crust and upper mantle, visco elasticity and rock failure criteria, Geochronology: Radiometric dating and their advantages, meaning of radiometric ages, Major features of the Earth’s gravitational field and relationship with tectonic processes in the crust and upper mantle, concept of isostasy, mathematical concept of Airy and Pratt hypotheses of isostasy

UNIT III MAGNETIC FIELD AND THERMAL DISTRIBUTION OF EARTH (9)
Origin of geomagnetic field, polar wandering, secular variations and westward drift, reversals of geomagnetic field, sun spot, solar flares, geomagnetic storms, sea-floor spreading, Paleomagnetism and its uses, Thermal history of the Earth, sources of heat generation and temperature distribution inside the earth, convection in the mantle

UNIT IV SEISMOLOGY (9)
Earthquake seismology, Earthquakes and its classifications, Global seismicity and tectonics, Earth’s internal structure derived from seismology, Earthquake mechanism and Anderson’s theory of faulting, Continental drift and plate tectonics: its essential features, present day plate motions, Triple junctions, oceanic ridges, Benioff zones, arcs, hot spots, Mantle Plume, Mountain building, origin of Himalaya, Geodynamics of Indian subcontinent.

UNIT V OCEANS (9)
Physical properties of seawater and methods of determination, distribution of salinity in the oceans, factors affecting salinity, water masses and water type, TS Diagram, Circulation of currents in major ocean waves. Tides: Dynamical and equilibrium theory of tides. Marine pollution, steps to control marine pollution, Laws of seas, Coastal zone management

Total: 45
**TEXT BOOKS:**

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<thead>
<tr>
<th>S.No</th>
<th>Author(s) Name</th>
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</tr>
</thead>
</table>

**WEBSITES:**

1. www.ocw.mit.edu
2. www.physicsclassroom.com
3. www.nptel.ac.in
4. www.physics.org
COURSE OBJECTIVES:

- To provide mathematical basis for acoustics waves.
- To present the characteristic behaviour of sound in pipes, resonators and filters.
- To introduce the properties of hearing and speech
- To describe the architecture and environmental inclusive of reverberation and noise.

UNIT I INTRODUCTION

UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES
Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers. Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III PIPES RESONATORS AND FILTERS

UNIT IV ARCHITECTURAL ACOUSTICS

UNIT V TRANSDUCTION
Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

Total Hours: 45
### TEXT BOOK:

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<tr>
<td></td>
<td>Austin R.Frey,</td>
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<tbody>
<tr>
<td>1</td>
<td>L. Beranek</td>
<td>Acoustics</td>
<td>Academic Press</td>
<td>2012</td>
</tr>
</tbody>
</table>

### WEBSITES:

1. www.acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www.ocw.mit.edu
COURSE OBJECTIVES:

- To understand about the fuel
- To study about the alcohols and its importance in engine
- To gain knowledge on the fuel gas and oils
- To get the information on fuel cell

UNIT I   INTRODUCTION (9)
Need for alternate fuel, availability and properties of alternate fuels, general use of alcohols, LPG, hydrogen, ammonia, CNG and LNG, vegetable oils and biogas, merits and demerits of various alternate fuels, introduction to alternate energy sources and significance.

UNIT II   ALCOHOLS (9)
Properties as engine fuel, alcohols and gasoline blends, performance in SI engines, methanol and gasoline blends, combustion characteristics in CI engines, emission characteristics, DME, DEE properties performance analysis, performance in SI & CI Engines.

UNIT III   NATURAL GAS, LPG, HYDROGEN AND BIOGAS (10)
Availability of CNG, properties, modification required to use in engines, performance and emission characteristics of CNG & LPG in SI & CI engines, performance and emission of LPG. Hydrogen storage and handling, performance and safety aspects. Production of Biogas and its applications.

UNIT IV   VEGETABLE OILS (8)
Various vegetable oils for engines, esterification, performance in engines, performance and emission characteristics, biodiesel and its characteristics.

UNIT V   ELECTRIC, HYBRID, FUEL CELL AND SOLAR CARS (9)
Layout of an electric vehicle, advantage and limitations, specifications, system components, electronic control system, high energy and power density batteries, hybrid vehicle, fuel cell vehicles, solar powered vehicles.

Total Hours: 45
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<tbody>
<tr>
<td>2.</td>
<td>Saeid Mokhatab</td>
<td>Hand book of Natural Gas</td>
<td>Gulf Professional Publisher, USA</td>
<td>2012</td>
</tr>
</tbody>
</table>

WEBSITES:

1. www.fao.org/docrep/t4470e/t4470e08.htm
2. http://www.exergy.se/goran/hig/ses/06/alternative%20fuels
COURSE OBJECTIVES:

- To understand about the solid waste
- To study about the waste treatment
- To gain knowledge on the disposal of waste and waste management.
- To get the information on energy conservation.

UNIT I  SOLID WASTE  

UNIT II  WASTE TREATMENT  
Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNIT III  WASTE DISPOSAL  

UNIT IV  HAZARDOUS WASTE MANAGEMENT  

UNIT V  ENERGY GENERATION FROM WASTE  

Total Hours: 45
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## WEBSITES:

COURSE OBJECTIVES:

- To understand about the green chemistry
- To study the atom efficient process and synthesis elaborately.
- To gain knowledge on the green technology and renewable energy resources.
- To get the information on catalysis

UNIT I  INTRODUCTION TO GREEN CHEMICAL PRINCIPLES (9)
Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluoruous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

UNIT II  ATOM EFFICIENT PROCESSES (9)
Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

UNIT III  BIOTECHNOLOGY AND GREEN CHEMISTRY (9)
Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

UNIT IV  RENEWABLE RESOURCES (9)
Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

UNIT V  CATALYSIS IN GREEN CHEMISTRY (9)
Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

Total Hours: 45

TEXT BOOKS:

<table>
<thead>
<tr>
<th>S. No.</th>
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</table>
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</thead>
<tbody>
<tr>
<td>2.</td>
<td>Dr. Sunita Ratan</td>
<td>A Textbook of Engineering Chemistry</td>
<td>S.K. Kataria and Sons</td>
<td>2012</td>
</tr>
</tbody>
</table>

### WEBSITES:

1. [http://www.organic-chemistry.org/topics/green-chemistry.shtm](http://www.organic-chemistry.org/topics/green-chemistry.shtm)
2. [http://www.essentialchemicalindustry.org/processes/green-chemistry.html](http://www.essentialchemicalindustry.org/processes/green-chemistry.html)
4. [http://www.epa.gov/research/greenchemistry/](http://www.epa.gov/research/greenchemistry/)
5. [http://www.amazon.in/Green-Chemistry-Catalysis](http://www.amazon.in/Green-Chemistry-Catalysis)
COURSE OBJECTIVES:

- To get the information on electrochemical material.
- To study about the conducting polymers.
- To understand about the fuel.
- To gain knowledge on the batteries and power sources.

UNIT I  METAL FINISHING  (9)

UNIT II  CONDUCTING POLYMERS AND ELECTROCHEMICALS  (9)
Lectropolymerisation- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene- Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNIT III  BATTERIES AND POWER SOURCES-I  (9)
Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNIT IV  BATTERIES AND POWER SOURCES-II  (9)
Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells-Introduction, types of fuel cells, advantages.

UNIT V  ELECTROCHEMICAL MATERIAL SCIENCE  (9)
Solar cells- Preparation of CdS/Cu$_2$S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

Total: 45

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</thead>
</table>

**WEBSITES:**

2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html
COURSE OBJECTIVES:

- To understand about the fuel
- To study about the abrasives and lubricants.
- To gain knowledge on inorganic chemicals and explosive materials.
- To get the information on agriculture chemicals.

UNIT I  CEMENT AND LIME (9)

UNIT II  ABRASIVES AND REFRACTORIES (9)

UNIT III  INORGANIC CHEMICALS (9)

UNIT IV  EXPLOSIVES (9)

UNIT V  AGRICULTURE CHEMICALS (9)

Total Hours: 45
### TEXT BOOKS:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>B.K. Sharma</td>
<td>Industrial Chemistry</td>
<td>Goel Publishing House, Meerut</td>
<td>2000</td>
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<tbody>
<tr>
<td>2</td>
<td>R.N. Sherve</td>
<td>Chemical process industries</td>
<td>McGraw-Hill, Kugakuisha Ltd., Tokyo</td>
<td>1984</td>
</tr>
<tr>
<td>4</td>
<td>S.D. Shukla and G.N. Pandy</td>
<td>A text book of chemical technology</td>
<td>Vikas publishing house pvt. Ltd, New Delhi</td>
<td>1979</td>
</tr>
</tbody>
</table>

### WEBSITES:

2. [http://www.hon.ch/HONselect/Selection/D01.html](http://www.hon.ch/HONselect/Selection/D01.html)
OPEN ELECTIVES

Department of Electrical & Electronics Engineering
COURSE OBJECTIVES

- To understand the basic concepts of electric hybrid vehicle.
- To gain the knowledge about electric propulsion unit.
- To understand and gain the knowledge about various energy storage devices.

UNIT I  INTRODUCTION
History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II  HYBRID ELECTRIC DRIVE-TRAINS
Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III  ELECTRIC PROPULSION UNIT
Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV  ENERGY STORAGE
Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V  ENERGY MANAGEMENT STRATEGIES
Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Total Hours: 45
**TEXT BOOK**

<table>
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<tbody>
<tr>
<td>1</td>
<td>Iqbal Hussein</td>
<td>Electric and Hybrid Vehicles: Design Fundamentals</td>
<td>CRC Press</td>
<td>2003</td>
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**REFERENCES**

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<th>Year of Publication</th>
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</thead>
</table>
COURSE OBJECTIVES

- To gain the knowledge about energy management.
- To understand the basic concepts in economic analysis in energy management.
- To understand the basic principles of energy audit.

UNIT I  ENERGY MANAGEMENT  (9)
Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting – Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II  ECONOMIC ASPECTS AND ANALYSIS  (9)
Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worth method.

UNIT III  BASIC PRINCIPLES OF ENERGY AUDIT  (9)
Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT IV  ENERGY EFFICIENT MOTORS  (9)

UNIT V  POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS  (9)

Total Hours: 45

Text Book

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</tr>
<tr>
<td>1</td>
<td>John.C.Andreas</td>
<td>Energy Efficient Electric Motors</td>
<td>Marcel Dekker Inc Ltd – 3rd edition</td>
<td>2005</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES

- To gain the knowledge about various types of Sensors & Transducers and their working principle.
- To understand the concepts of Resistive, Capacitive and Inductive transducers.
- To gain knowledge about characteristics of transducers.

UNIT I  INTRODUCTION OF TRANSDUCERS  (9)
Transducer – Classification of transducers – Basic requirement of transducers.

UNIT II  CHARACTERISTICS OF TRANSDUCERS  (9)

UNIT III  RESISTIVE TRANSDUCERS  (9)

UNIT IV  INDUCTIVE AND CAPACITIVE TRANSDUCER  (9)

UNIT V  MISCELLENEOUS TRANSDUCERS  (9)

Total Hours: 45

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<tr>
<td>2</td>
<td>Patranabis. D</td>
<td>Sensors and Transducers</td>
<td>Prentice Hall of India</td>
<td>1999</td>
</tr>
<tr>
<td>4</td>
<td>Murthy. D.V.S</td>
<td>Transducers and Instrumentation</td>
<td>Prentice Hall of India</td>
<td>2001</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To understand the principles of PID.

UNIT I INTRODUCTION

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

Total Hours: 45

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<tbody>
<tr>
<td>1</td>
<td>John Webb and Ronald A Reiss</td>
<td>Programmable Logic Controllers – Principle and Applications</td>
<td>Fifth edition, PHI</td>
<td></td>
</tr>
</tbody>
</table>

WEBSITE

http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logic controller
COURSE OBJECTIVES

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
- To understand the basic principles fuel cell, Geo thermal power plants.
- To gain the knowledge about hydro energy.

UNIT I  INTRODUCTION


UNIT II  SOLAR ENERGY


UNIT III  WIND ENERGY


UNIT IV  HYDRO ENERGY

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V  OTHER SOURCES

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

Total Hours: 45

TEXT BOOKS

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<th>Title of the book</th>
<th>Publisher</th>
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<tbody>
<tr>
<td>1</td>
<td>Rai.G.D</td>
<td>Non-conventional resources of energy</td>
<td>Khanna publishers ,Fourth edition</td>
<td>2010</td>
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</table>
# REFERENCES

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<th>S. No.</th>
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<th>Publisher</th>
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<tbody>
<tr>
<td>3</td>
<td>John W Twidell and Anthony D Weir</td>
<td>Renewable Energy Resources</td>
<td>Taylor and Francis</td>
<td>2006</td>
</tr>
</tbody>
</table>

**WEBSITES**

1. www.energycentral.com
2. www.catelectricpowerinfo.com
COURSE OBJECTIVES

- To understand the concept of state variable analysis.
- To understand time domain and frequency domain analysis of control systems required for stability analysis.
- To understand the concept of optimal control.

UNIT I STATE VARIABLE ANALYSIS  (9)
Concept of state – State Variable and State Model – State models for linear and continuous time systems – Solution of state and output equation – controllability and observability - Pole Placement – State observer Design of Control Systems with observers

UNIT II PHASE PLANE AND DESCRIBING FUNCTION ANALYSIS  (9)

UNIT III Z-TRANSFORM AND DIGITAL CONTROL SYSTEM  (9)

UNIT IV STATE-SPACE DESIGN OF DIGITAL CONTROL SYSTEM  (9)

UNIT V OPTIMAL CONTROL  (9)

Total Hours: 45

TEXT BOOKS

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<tbody>
<tr>
<td>2</td>
<td>Ashish Tewari</td>
<td>Modern control Design with Matlab and Simulink</td>
<td>John Wiley, New Delhi</td>
<td>2002</td>
</tr>
<tr>
<td>3</td>
<td>Benjamin C. Kuo</td>
<td>Digital Control Systems</td>
<td>Oxford University Press</td>
<td>1992</td>
</tr>
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<tbody>
<tr>
<td>2</td>
<td>M. Gopal</td>
<td>Modern control system theory</td>
<td>New Age International Publishers</td>
<td>2002</td>
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<td></td>
<td>Abbasmami-Naeini</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>Raymond T. Stefani &amp; Co</td>
<td>Design of feedback Control systems</td>
<td>Oxford University</td>
<td>2002</td>
</tr>
</tbody>
</table>
OPEN ELECTIVES
Department of Electronics and Communication Engineering
15BEEC7OE01 REAL TIME EMBEDDED SYSTEMS

COURSE OBJECTIVES

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing
- To study about memory management

UNIT - I INTRODUCTION TO EMBEDDED SYSTEM (9)

Introduction - Embedded systems description, definition, design considerations & requirements - Overview of Embedded system Architecture (CISC and RISC) - Categories of Embedded Systems - embedded processor selection & tradeoffs - Embedded design life cycle - Product specifications - hardware/software partitioning - iterations and implementation - hardware software integration - product testing techniques – ARM 7

UNIT – II OPERATING SYSTEM OVERVIEW (9)


UNIT – III TASK MANAGEMENT (9)


UNIT – IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING (9)


UNIT - V MEMORY MANAGEMENT (9)

Memory Management: Memory Control Blocks – Creating Partition- Obtaining a Memory Block – Returning a Memory Block .Getting Started with μC/OS-II – Installing μC/OS-II – Porting μC/OS-II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with μC/OS-II - μC/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Analyze the Multichannel ADC with help of μC/OS-II.

Total Hours: 45
<table>
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<tbody>
<tr>
<td>1</td>
<td>Jean J. Labrosse</td>
<td>MicroC/OS – II The Real Time Kernel</td>
<td>CMP BOOKS</td>
<td>2009</td>
</tr>
<tr>
<td>3</td>
<td>Steve Furbe,</td>
<td>ARM System-on-Chip Architecture,</td>
<td>Addison-Wesley</td>
<td>2000</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES

- To study about various speakers and microphone
- To learn the fundamental of television systems and standards
- To learn the process of audio recording and reproduction
- To study the various telephone networks

UNIT I LOUDSPEAKERS AND MICROPHONES


UNIT – II TELEVISION STANDARDS AND SYSTEMS


UNIT – III OPTICAL RECORDING AND REPRODUCTION


UNIT – IV TELECOMMUNICATION SYSTEMS

Telephone services - telephone networks – switching system principles – PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellular modems

UNIT – V HOME APPLIANCES

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

Total Hours: 45

Text Book:

COURSE OBJECTIVES:

- To familiar the important concepts applicable to small electronic devices, their fabrication, characterization and application

UNIT I- LIMITATIONS OF CMOS


UNIT II- MICRO AND NANO FABRICATION


UNIT III- CHARACTERIZATION EQUIPMENTS


UNIT IV- NANO DEVICES – I


UNIT V- NANO DEVICES – II

*Quantum computing*: principles – Qbits – Carbon nanotubes (CNT): Characteristics, CNTFET, Application of CNT - Spintronics: Principle, Spin valves, Magnetic Tunnel Junctions, SpinFETs, MRAM

Total Hours: 45

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<tbody>
<tr>
<td>1</td>
<td>Rainer Waser (Ed)</td>
<td>Nano electronics and information technology</td>
<td>Wiley- VCH. 3rd Edition</td>
<td>2012</td>
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<tr>
<td>2</td>
<td>Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse</td>
<td>Nanotechnology – (Basic Science and Emerging Technologies</td>
<td>Overseas Press</td>
<td>2002</td>
</tr>
<tr>
<td>3</td>
<td>Mark Ratner, Daniel Ratner</td>
<td>Nanotechnology: A Gentle introduction to the Next Big idea</td>
<td>Pearson education</td>
<td>2003</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques.
- To study the image compression procedures.
- To study the image segmentation and representation techniques.
- To study the video processing fundamentals and motion estimation.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING AND IMAGE TRANSFORMS (9)
Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels Image Transforms: 2 – D Discrete Fourier Transform, Discrete Cosine Transform, Discrete Wavelet transforms.

UNIT II IMAGE PROCESSING TECHNIQUES (9)

UNIT III IMAGE SEGMENTATION AND COMPRESSION (9)
Segmentation concepts, point, line and Edge detection, Thresholding, region based segmentation; Image Compression Image compression fundamentals – coding Redundancy, spatial and temporal redundancy. Compression models : Lossy and Lossless, Huffman coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding, predictive coding, wavelet coding, JPEG standards.

UNIT IV BASICS OF VIDEO PROCESSING (9)
Analog video, Digital Video, Time varying Image Formation models : 3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals, filtering operations.

UNIT V 2-D MOTION ESTIMATION (9)
Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding.

Total Hours: 45
**TEXTBOOKS**
2. Yao wang, Joem Ostarmann and Ya – quin Zhang, "Video processing and communication ", 1\textsuperscript{st} edition PHI

**REFERENCE BOOKS**
1. M. Tekalp, ”Digital video Processing”, Prentice ll International
COURSE OBJECTIVES

- To introduce the basic concepts of MOS technologies
- To understand the concepts of selecting a VLSI technology based on project specification
- To enable the student to understand the floor planning, place and route optimization techniques.

UNIT 1:
(9)
Introduction to MOS Technologies: MOS, CMOS, BiCMOS Technology, Trends and Projections.
Basic Electrical Properties of MOS, CMOS & BiCMOS Circuits: \( I_{ds} - V_{ds} \) relationships, Threshold Voltage \( V_t \), \( G_m \), \( G_{ds} \) and \( \omega_0 \), Pass Transistor, MOS, CMOS & Bi CMOS Inverters, \( Z_{pu}/Z_{pd} \), MOS Transistor circuit model, Latch-up in CMOS circuits.

UNIT II:
(9)

UNIT III:
(9)
Combinational Logic Networks: Layouts, Simulation, Network delay, Interconnect design, Power optimization, Switch logic networks, Gate and Network testing.

UNIT IV:
(9)
Sequential Systems: Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and testing.

UNIT V:
(9)
Floor Planning & Architecture Design: Floor planning methods, off-chip connections, High-level synthesis, Architecture for low power, SOCs and Embedded CPUs, Architecture testing.

Total Hours: 45

TEXT BOOKS:


REFERENCES:

COURSE OBJECTIVES:
- To introduce MEMS and micro fabrication.
- To study the essential electrical and mechanical concepts of MEMS.
- To study various sensing and actuating technique.
- To know about the polymer and optical MEMS.

UNIT I-INTRODUCTION TO MEMS AND MICRO FABRICATION (9)

UNIT II-ELECTRICAL AND MECHANICAL CONCEPTS OF MEMS (9)
Conductivity of semiconductors, crystal plane and orientation, stress and strain - definition - Relationship between tensile stress and strain- mechanical properties of Silicon and thin films, Flexural beam bending analysis under single loading condition- Types of beam- longitudinal strain under pure bending -deflection of beam- Spring constant, torsional deflection, intrinsic stress, resonance and quality factor.

UNIT III-ELECTROSTATIC AND THERMAL PRINCIPLE SENSING AND ACTUATION (9)
Electrostatic sensing and actuation-Parallel plate capacitor - Application- Inertial, pressure and tactile sensor parallel plate actuator- comb drive Thermal sensing and Actuations-Thermal sensors-Actuators- Applications Inertial, flow and infrared sensors.

UNIT IV-PIEZORESISTIVE, PIEZOELECTRIC AND MAGNETIC PRINCIPLE SENSORS AND ACTUATOR (9)

UNIT V-POLYMER AND OPTICAL MEMS (9)
Polymers in MEMS- polymide-SU-8 Liquid crystal polymer(LCP )- PDMS – PMMA – Parylene - Fluorocarbon, Application-Acceleration, pressure, flow and tactile sensors. Optical MEMS-passive MEMS optical components-lenses-mirrors-Actuation for active optical MEMS.

Total Hours: 45
**TEXT BOOK:**

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Author(s) Name</th>
<th>Title of the book</th>
<th>Publisher</th>
<th>Year of publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chang Liu</td>
<td>Foundations of MEMS</td>
<td>Pearson Indian Print, 1st Edition</td>
<td>2012</td>
</tr>
</tbody>
</table>

**REFERENCES:**

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<tr>
<td>1</td>
<td>Gaberiel M. Rebiz</td>
<td>RF MEMS Theory, Design and Technology</td>
<td>John Wiley &amp; Sons</td>
<td>2003</td>
</tr>
<tr>
<td>2</td>
<td>Charles P. Poole and Frank J. Owens</td>
<td>Introduction to Nanotechnology</td>
<td>John Wiley &amp; Sons</td>
<td>2003</td>
</tr>
<tr>
<td>3</td>
<td>Julian W. Gardner and Vijay K Varadhan</td>
<td>Microsensors, MEMS and Smart Devices</td>
<td>John Wiley &amp; sons</td>
<td>2001</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:

- To introduce the basic concepts of neural networks and its applications in various domain
- Students will know how to use Soft Computing to solve real-world problems
- Students will have solid understanding of Basic Neural Network.

UNIT I  INTRODUCTION TO NEURAL NETWORKS  (9)
Introduction - biological neurons and their artificial models - learning, adaptation and neural network's learning rules - types of neural networks- single layer, multiple layer- feed forward, feedback networks

UNIT II LEARNING PROCESS  (9)

UNIT III PERCEPTION  (9)
Single layer perception-Adaptive filtering-unconstrained optimization-Least-mean square algorithm-Leaning curve-Annealing Technique-perception convergence theorem-Relationship between perception and Bayes' classifier-Back propagation algorithm

UNIT IV ATTRACTOR NEURAL NETWORK AND ART  (9)

UNIT V SELF ORGANIZATION  (9)

Total Hours: 45

REFERENCES:
1. Simon Haykin, “Neural Networks and Learning Machines” -3/E - Pearson/ Prentice Hall 2009
2. Satish Kumar- “Neural Networks : A Classroom Approach”-TMH-2008
COURSE OBJECTIVES:

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- Students will know how to use Fuzzy computation to solve real-world problems
- Students will have solid understanding of Basic fuzzy models.

UNIT - I
Basics Of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT – II
Theory Of Approximate Reasoning: Linguistic variables, Fuzzy proportions, Fuzzy if-then statements, inference rules, compositional rule of inference-fuzzy models

UNIT – III
Fuzzy Knowledge Based Controllers (Fkbc): Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzification and defuzzification procedures – Design of Fuzzy Logic Controller

UNIT – IV

UNIT V
Fuzzy Based Systems -Simple applications of FKBC -washing machines- traffic regulations -lift control-fuzzy in medical applications-Introduction to ANFIS.

Total Hours: 45

TEXT BOOKS:

OPEN ELECTIVES
Department of Bio Technology
Course Objectives:
1. To understand the basic design of bioreactors
2. To understand the principle of heat transfer inside a bioreactor
3. To understand the principle of heat transfer inside a bioreactor
4. To design bioreactors for various operations

UNIT I Engineering Properties and Storage Tank (9)
Introduction to various mechanical properties of material to be used material of construction, design of cylindrical storage tank.

UNIT II Reactor Design (9)
Design of Airlift fermentor, Bubble column reactor and Continuous stirred tank reactor.

UNIT III Heat Transfer Equipments (9)
Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulation evaporator.

UNIT IV Mass Transfer Equipments (9)
Design of Bollmann extractor, fractionating column, packed tower and spray tray absorber

UNIT V Separation Equipments (9)
Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rotart drum drier and Swenson –walker crystallizer.

Text books:

References:
Course Objectives:

- Properties of food material
- Various methods used for preserving fruits and vegetables.

UNIT I Scope And Importance of Food Processing (9)

Properties of food- Physical, thermal, mechanical, sensory. Raw material Preparation - Cleaning, sorting, grading, peeling.

UNIT II Processing Methods (9)


UNIT III Food Conversion Operations (9)

Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membrane separation- filtration- equipment and application.

UNIT IV Food Preservation by Cooling (9)

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Water activity, methods to control water activity.

UNIT V Preservation Methods for Fruits and Vegetables (9)

Pre processing operations - preservation by reduction of water content: drying /dehydration and concentration – chemical preservation – preservation of vegetables by acidification, preservation with sugar - Heat preservation– Food irradiation- Combined preservation techniques.

Text books:

3. Mircea Enachescu Dauthy Fruit and Vegetable Processing FAO agricultural services bulletin no.119 1995

References:

2. B. Sivasankar Food processing and Preservation PHI Learning Pvt. Ltd 2002
Course Objectives:

- To learn various force fields, simulation methods in molecular modeling
- To have better understanding on molecular docking and ligand based drug design methods

UNIT-I  Molecular Modelling  (9)
Introduction to concept of molecular modeling, molecular structure and internal energy, applications of molecular graphics, coordinate systems, potential energy surfaces, discussion of local and global energy minima

UNIT-II  Quantum Mechanics  (9)
Introduction to the computational quantum mechanics; one electron atom, poly electronic atoms and molecules, Hartree Fock equations; calculating molecular properties using ab initio and semi empirical methods.

UNIT-III  Molecular Mechanics  (9)
Molecular mechanics; general features of molecular mechanics force field, bond stretching, angle bending, torsional terms, non – bonded interactions; force field parameterization and transferability; energy minimization; derivative and non – derivative methods, applications of energy minimization.

UNIT-IV  Molecular Dynamics  (9)
Molecular dynamics simulation methods; molecular dynamics using simple models, molecular dynamics with continuous potential, setting up and running a molecular dynamic simulation, constraint dynamics; Monte Carlo simulation; Monte Carlo simulation of molecules.

UNIT-V  Modeling and Drug Design  (9)
Macromolecular modeling, design of ligands for known macro molecular target sites, Drug-receptor interaction, classical SAR /QSAR studies and their implications to the 3 D modeler, 2-D and 3-D database searching, pharmacophore identification and novel drug design, molecular docking, Structure-based drug design for all classes of targets.

Text Books:
1. Andrew Leach Molecular Modelling: Principles and Applications Prentice Hall 2001

References:
Course Objectives:

- To understand the consequences of pollution
- To study the various techniques and methods used for bioremediation

UNIT-I Overview Of Bioremediation

Pollution: Types and its consequences, History of bioremediation, Sources of contamination, Bioremediation processes, Environments where bioremediation is used, Microbiology of bioremediation.

UNIT-II Biofilm Processes

Trickling Filters and Biological Towers, Rotating Biological Contactors, Granular Media Filters, Fluidized-bed Reactors, Hybrid Biofilm Processes

UNIT-III Bioremediation for Soil Environment

Environment of Soil Microorganisms, Soil Organic Matter and Characteristics, Soil Microorganisms Association with Plants, Pesticides and Microorganisms, Petroleum Hydrocarbons and Microorganisms, Industrial solvents and Microorganism, Biotechnologies for Ex-Situ Remediation & in-Situ Remediation of Soil Phytoremediation Technology for Soil Decontamination

UNIT-IV Bioremediation for Air and Water Environment

Atmospheric Environment for Microorganisms, Microbial Degradation of Contaminants in Gas Phase, Biological Filtration Processes for Decontamination of Air Stream-Biofiltration, Biotrickling Filtration, Bioscrubbers, Contaminants in Groundwater, Landfill Leachate Biotreatment Technologies, Industrial Wastewater Biotreatment Technologies, Biotreatment of Surface Waters

UNIT-V Bioremediation of Metals

Microbial Transformation of Metals, Biological Treatment Technologies for Metals Remediation, Bioleaching and Biobenification, Bioaccumulation, Oxidation/Reduction Processes, Biological Methylation
Text Books:

References:
Course Objectives:

- To gain structural knowledge of biological systems.
- To understand transport and dynamic properties of biological systems.

UNIT I  Molecular Structure of Biological Systems (9)


UNIT II  Conformation of Nucleic Acids (9)


UNIT III  Conformation of Proteins (9)


UNIT IV  Energetics & Dynamics of Biological Systems (9)

Kinetics of ligand interactions; Biochemical kinetics studies, uni-molecular reactions, simple bi molecular multiple intermediates, steady state kinetics, catalytic efficiency, relaxation spectrometry, ribonuclease as an example.

UNIT V  Applied Techniques (9)


Text books:

2. Michel Daune Molecular Biophysics: Structures in Motion, Oxford University Press 1999
Course Objectives:

- To enable the students to get aware of available tools and databases for performing research in bioinformatics.
- To provide the thorough understanding of protein structure in detail.

UNIT I Overview of Bioinformatics (9)

The scope of bioinformatics; bioinformatics & the internet; useful bioinformatics sites. Data acquisition: sequencing DNA, RNA & proteins; determination of protein structure; gene & protein expression data; protein interaction data. Databases – contents, structure & annotation: file formats; annotated sequence databases; miscellaneous databases.

UNIT II Retrieval of Biological Data (9)

Data retrieval with Entrez & DBGET/ LinkDB; data retrieval with SRS (sequence retrieval system). Searching sequence databases by sequence similarity criteria: sequence similarity searches; amino acid substitution matrices; database searches, FASTA & BLAST; sequence filters; iterative database searches & PSI-BLAST. Multiple-sequence alignment, gene & protein families: multiple-sequence alignment & family relationships; protein families & pattern databases; protein domain families.

UNIT III Phylogenetics (9)

Phylogenetics, cladistics & ontology; building phylogenetic trees; evolution of macromolecular sequences. Sequence annotation: principles of genome annotation; annotation tools & resources.

UNIT IV Structural Bioinformatics (9)

Conceptual models of protein structure; the relationship of protein three-dimensional structure to protein function; the evolution of protein structure & function; obtaining, viewing & analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure: CATH & SCOP; introduction to protein structure prediction; structure prediction by comparative modeling; secondary structure prediction; advanced protein structure prediction & prediction strategies.
Microarray data, analysis methods; microarray data, tools & resources; sequence sampling & SAGE. Bioinformatics in pharmaceutical industry: informatics & drug discovery; pharmainformatics resources. Basic principles of computing in bioinformatics: running computer software; computer operating systems; software downloading & installation; database management.

Textbook


References:

Course Objectives:

- To develop skills of the students in the field of nano biotechnology and its applications in various fields.
- The course will serve as an effective course to understand Socio-economic issues of nanobiotechnology.

UNIT I    Introduction


UNIT II    Nano Particles


UNIT III    Applications


UNIT IV    Nanobiotechnology


UNIT V    Ethical Issues In Nanotechnology

Text Books:

2. Goodsell, D.S. Bionanotechnology John Wiley and Sons, Inc 2004

References:

2. Bhushan, B. Springer Handbook of Nanotechnology Springer- Verlag Berlin Heidelberg, 2004
3. Freitas Jr R.A Nanomedicine Landes Biosciences, 2004
OPEN ELECTIVES
Department of Mechanical Engineering
Course Objectives:

- Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.
- Ability to understand and analyse, linear and digital electronic circuits.

UNIT I Introduction (9)


UNIT II Sensors and Actuators-I (9)


UNIT III Sensors and Actuators-II (9)


UNIT IV Micromachining (9)


UNIT V Polymer and Optical Mems (9)

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

Text Books:

References:
Course Objectives:

- Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics

UNIT I  
Fundamentals of Robot  

UNIT II  
Drives and Sensors  
Drives- hydraulic, pneumatic and electrical. Force sensing, touch and tactile sensors, proximity sensors, non contact sensors and Machine vision sensors. Safety considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance mechanism.

UNIT III  
Programming and Applications  
Robot programming languages – VAL programming – Motion Commands, Sensors commands. Role of robots in inspection, assembly, material handling, underwater, space, nuclear, defence and medical fields.

UNIT IV  
Machine Vision  
Machine Vision - Sensing - Low and higher level vision - Image acquisition and digitization - Cameras, CCD,CID, CPD, etc., - Illumination and types - Image processing and analysis - Feature extraction - Applications.

UNIT V  
Implementation and Robot Economics  
RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

Text Books:


References:

Course Objectives:

- Upon completion of this course, the students can able to understand the role of logistics and understand the phases of supply chain

UNIT I  Introduction to Logistics

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNIT II  Phases of Supply Chain

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III  Evolution of Supply Chain Models


UNIT IV  Supply Chain Activities

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNIT V  Scm Organisation And Information System

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP.. - Case study, ERP Software's

Text Books:


References:

Course Objectives:

1. Upon completion of this course, the students can able to understand the relationship between free energy, entropy, internal energy, and enthalpy

UNIT I  Introduction and Basic Concepts  

General overview of transport phenomena including various applications, Transport of momentum, heat and mass, Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II  Properties, Units and Other Physical Parameters  

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III  Momentum Transport  

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non-Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNIT IV  Energy Transport  

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heat transfer

UNIT V  Mass Transport  

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion- Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

References:

2. https://laulima.hawaii.edu/portal
Course Objectives:

1. Biomechanics provides key information on the most effective and safest movement patterns, equipment, and relevant exercises to improve human movement.

UNIT I Introduction

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNIT II Key Mechanical Concepts

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

UNIT III Human Anatomy And Some Basic Terminology


UNIT IV Anatomical Description

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNIT V Mechanics Of The Musculoskeletal System


References:

OPEN ELECTIVES
Department of Aerospace Engineering
COURSE OBJECTIVES:

- To develop a basic knowledge about satellite orbits, satellite dynamics and orbital elements.
- To learn the different cases of satellite orbit transfer, orbit perturbations.
- Basic of rocket flight dynamics, and ballistic missile trajectories.

UNIT I - ORBITAL MECHANICS (9)
Fundamentals of orbital dynamics, two body problem, circular and escape velocities, motion in circular, elliptical, parabolic and hyperbolic orbits, different space missions, applications, types of satellite orbits, two body problem, equation of motion, orbit equation.

UNIT II - ORBITS IN THREE DIMENSIONS (9)
Different coordinate frames, coordinate transformation, Orbital elements, relations between position and time, Effects of the earth’s oblateness, Orbit perturbation due to third body, orbit decay and life time.

UNIT III - ORBITAL MANEUVER (9)
Impulsive maneuvers, Hohmann transfer, one tangent burn transfer, bi-elliptic Hohmann transfer, Phasing maneuvers, Plane change maneuvers.

UNIT IV - ROCKET MOTION IN FREE SPACE AND GRAVITATIONAL FIELD (9)
Multistage Rocket systems- rocket performance, restricted staging in field-free space, One dimensional and two dimensional rocket motions in free space and homogeneous gravitational fields - Description of vertical, inclined and gravity turn trajectories.

UNIT V - BALLISTIC MISSILE TRAJECTORIES (9)
Free-flight range equation, flight-path angle equation, maximum range trajectory, time of free-Flight, effect of earth rotation, effect of launching errors on range.

Total Hours: 45

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### WEB REFERENCES:
1. [http://nptel.ac.in/courses/101106046/](http://nptel.ac.in/courses/101106046/)
2. [ocw.tudelft.nl/.../aerospace.../introduction...aerospace.](ocw.tudelft.nl/.../aerospace.../introduction...aerospace.)
3. [www.space.com/](www.space.com/)
4. [www.nasa.gov/directorates/spacetech/home](www.nasa.gov/directorates/spacetech/home)
5. [www.spacefoundation.org](www.spacefoundation.org)
COURSE OBJECTIVES:
To provide in-depth knowledge on various techniques of non-destructive testing.

UNIT I INTRODUCTION
Properties of Materials – Characteristics of Ferrous, Non-ferrous and Alloys. Destructive testing and Non-destructive testing – Classification – Uses and applications. Codes, Standards and Specifications (ASME, ASTM, AWS etc.).

UNIT II PENETRANT TESTING AND MAGNETIC PARTICLE INSPECTION
Introduction to Penetrant Testing – Liquid Penetrants and Dye Penetrants - An Illustration of Penetrant Testing, Advantages of Penetrant Testing, Disadvantages of Penetrant Testing. Introduction to Magnetic Particle Inspection - An Illustration of Magnetic Particle Inspection, Advantages of Magnetic Particle Crack Detection, Disadvantages of Magnetic Particle Crack Detection

UNIT III ULTRASONIC FLAW DETECTION AND RADIOGRAPHY INSPECTION

UNIT IV EDDY CURRENT AND ELECTRO-MAGNETIC METHODS

UNIT V NON-DESTRUCTIVE INSPECTION (NDI) AND ITS APPLICATIONS
Inspection of Raw Products, Inspection For In-Service Damage, Power Plant Inspection, Storage Tank Inspection, Aircraft Inspection, Jet Engine Inspection, Pressure Vessel Inspection, Bridge Inspection, Pipeline Inspection.

Total Hours: 45
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</thead>
</table>

WEB REFERENCE:

1. https://www.asnt.org/MinorSiteSections/AboutASNT/Intro-to-NDT
2. https://www.asnt.org/
3. www.bindt.org/
4. www.ndt.net/
COURSE OBJECTIVES

- Ability to design UAV system
- Ability to identify different hardware for UAV

UNIT I INTRODUCTION TO UAV


UNIT II THE DESIGN OF UAV SYSTEMS


UNIT III AVIONICS HARDWARE

Autopilot – AGL-pressure sensors-servos-accelerometer – gyro-actuators – power supply – processor, integration, installation, configuration, and testing

UNIT IV COMMUNICATION PAYLOADS AND CONTROLS


UNIT V THE DEVELOPMENT OF UAV SYSTEMS


Total Hours: 45

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<tr>
<td>1.</td>
<td>Reg Austin</td>
<td>Unmanned Aircraft Systems UAV design, development and deployment</td>
<td>John Wiley &amp; Sons New York</td>
<td>2010</td>
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</table>

WEB REFERENCES:
3. www.theuav.com/
COURSE OBJECTIVES
To study the procedure of the formation of aerodrome, its design and the concepts of air transportation.

UNIT - I INTRODUCTION
Development of air transportation, comparison with other modes of transport – Role of IATA, ICAO – The general aviation industry airline – Factors affecting general aviation, use of aircraft, airport; airline management and organization – levels of management, functions of management, Principles of organization planning the organization – chart, staff departments & line departments.

UNIT – II AIRLINE ECONOMICS
Forecasting – Fleet size, Fleet planning, the aircraft selection process, operating cost, passenger capacity, load factor etc. – Passenger fare and tariffs – Influence of geographical, economic & political factors on routes and route selection.


UNIT - III PRINCIPLES OF AIRLINES SCHEDULING
Equipment maintenance, Flight operations and crew scheduling, Ground operations and facility limitations, equipments and types of schedule – hub & spoke scheduling, advantages / disadvantages & preparing flight plans – Aircraft scheduling in line with aircraft maintenance practices.

UNIT - IV AERODROME DATA, PHYSICAL CHARACTERISTICS AND OBSTACLE RESTRICTION

UNIT - V VISUAL AIDS FOR NAVIGATION, VISUAL AIDS FOR DENOTING OBSTACLES EMERGENCY AND OTHER SERVICES
Visual aids for navigation Wind direction indicator – Landing direction indicator – Location and characteristics of signal area – Markings, general requirements – Various markings – Lights, general requirements – Aerodrome beacon, identification beacon – Simple approach lighting system and various lighting systems – VASI & PAPI - Visual aids for denoting obstacles; object to be marked and lighter – Emergency and other services.

Total Hours: 45
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<td>2.</td>
<td>Fedric J.H</td>
<td>Aircraft Management</td>
<td>English Book house New Delhi</td>
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<td>The English Book Store</td>
<td>Connaught Circus, New Delhi</td>
<td>1997</td>
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</table>

**WEB REFERENCES:**

1. [www.grc.nasa.gov/WWW/k-12/airplane/](http://www.grc.nasa.gov/WWW/k-12/airplane/)
5. [www.brown.edu/Departments/EEB/EML/.../principles_flight.html](http://www.brown.edu/Departments/EEB/EML/.../principles_flight.html)
COURSE OBJECTIVES

To introduce the basic concepts of various avionics systems of aircraft.

UNIT I INTRODUCTION TO AVIONICS (9)

Need for avionics in civil and military aircraft and space systems – integrated avionics and weapon systems – typical avionics subsystems, design, technologies – Introduction to digital computer and memories.

UNIT II DIGITAL AVIONICS ARCHITECTURE (9)


UNIT III FLIGHT DECKS AND COCKPITS (9)

Control and display technologies: CRT, LED, LCD, EL and plasma panel – Touch screen – Direct voice input (DVI) – Civil and Military Cockpits: MFDS, HUD, MFK, HOTAS

UNIT IV INTRODUCTION TO NAVIGATION SYSTEMS (9)


UNIT V AIR DATA SYSTEMS AND AUTO PILOT (9)

Air data quantities – Altitude, Air speed, Vertical speed, Mach Number, Total air temperature, Mach warning, Altitude warning – Auto pilot – Basic principles, Longitudinal and lateral auto pilot.

Total Hours: 45

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<td>1.</td>
<td>Albert Helfrick.D</td>
<td>Principles of Avionics</td>
<td>Avionics Communications Inc</td>
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1. www.ntps.edu/courses/116-introduction-to-avionics-systems-course
2. www.ece.ucsb.edu/courses/ECE152/152A_Su11Shynk/Lec1.pdf
4. www.pbase.com/bruceleibowitz/cockpit
5. www.cranfield.ac.uk/soe/shortcourses/.../avionics-introduction.html
OPEN ELECTIVES
Department of Automobile Engineering
COURSE OBJECTIVES:

- This course enables the students to know about all the main and auxillary systems of automobile with its base construction and working.

UNIT-I ENGINE AND FUEL FEED SYSTEMS
Classification of Engine , construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburettor working principle, requirements of an automotive carburettor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNIT-II TRANSMISSION SYSTEMS

UNIT-III SUSPENSION SYSTEM

UNIT-IV BRAKES

UNIT-V ELECTRICAL SYSTEM
Principle and construction of lead acid battery. Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator. Starting System and charging system.

TEXT BOOKS

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<tr>
<th>SL.NO.</th>
<th>AUTHOR(S)</th>
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<tr>
<td>3.</td>
<td>Dr.Kirpal Singh</td>
<td>Automobile Engineering</td>
<td>Standard Publishes</td>
<td>2011</td>
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# REFERENCES

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COURSE OBJECTIVES:
- The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.

UNIT I  INTRODUCTION
Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II  POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS
2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III  CLUTCHES AND TRANSMISSION
Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV  FRAMES, SUSPENSION, WHEELS AND TYRES
Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V  THREE WHEELERS
Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

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COURSE OBJECTIVES:

- The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems in Automobile.

UNIT I MAINTENANCE OF RECORDS AND SCHEDULES
Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE
Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE
Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE
Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY
Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

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<td>Service Manuals from Different Vehicle Manufacturers</td>
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COURSE OBJECTIVES:

- This course enables the students to have a knowledge about the recent technologies that is in use in automobile.

UNIT I TRENDS IN POWER PLANTS

UNIT II DRIVER ASSISTANCE SYSTEMS
Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti spin regulation, traction control systems, cylinder cut-off technology, ABS, Driver Drowsiness Detection system

UNIT III SUSPENSION BRAKES AND SAFETY
Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT IV NOISE & POLLUTION
Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT V TELEMATICS
Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

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OPEN ELECTIVES
Department of Civil Engineering
OBJECTIVE:

At the end of the this course the students should have learnt the basic terms of housing programmes, planning and designing of housing projects, construction techniques and cost effective materials and housing finance and project appraisal techniques.

UNIT I  INTRODUCTION TO HOUSING

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II  HOUSING PROGRAMMES

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNIT III  PLANNING AND DESIGN OF HOUSING PROJECTS

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV  CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V  HOUSING FINANCE AND PROJECT APPRAISAL


TOTAL HOURS : 45

TEXT BOOKS


REFERENCES

2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 2000.
OBJECTIVE:
At the end of this course the students should have learnt various machineries of construction, electrical systems in building, design and principle of illumination, refrigeration principle and application and various fire safety installations.

UNIT I MACHINERIES
Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS

UNIT V FIRE SAFETY INSTALLATION

TOTAL HOURS: 45
TEXT BOOKS

REFERENCES
OBJECTIVE:
At the end of this course the students should have learnt the different land forms of coastal zone, wave dynamics, methods of wave forecasting, coastal process and harbour maintenance.

UNIT I COASTAL ZONE
Coastal zone – Coastal zone regulations – Beach profile – Surf zone – Off shore – Coastal waters – Estuaries – Wet lands and Lagoons – Living resources – Non living resources.

UNIT II WAVE DYNAMICS

UNIT III WAVE FORECASTING AND TIDES

UNIT IV COASTAL PROCESSES
Erosion and depositional shore features – Methods of protection – Littoral currents – Coastal aquifers – Sea water intrusion – Impact of sewage disposal in seas.

UNIT V HARBOURS

TOTAL HOURS: 45

TEXT BOOKS

REFERENCES
2. Dwivedi, S.N., Natarajan, R and Ramachandran, S., “Coastal Zone Management in Tamilnadu”
OBJECTIVE:
At the end of this course the students should have learnt the concept of devices, measurement, gauging, recording non destructive testing techniques and laws of similitude.

UNIT I MEASUREMENTS
Basic Concept in Measurements, Measurement of displacement, strain pressure, force, torque etc, Type of strain gauges (Mechanical, Electrical resistance, Acoustical etc.).

UNIT II GAUGING
Strain gauge circuits – The potentiometer and Wheatstone bridge – use of lead wires switches etc. Use of electrical resistance strain gauges in transducer applications.

UNIT III RECORDING DEVICES
Indicating and recording devices - Static and dynamic data recording – Data (Digital and Analogue) acquisition and processing systems. Strain analysis methods – Rosette analysis. Static and dynamic testing techniques. Equipment for loading-Moiré’s techniques.

UNIT IV NON DESTRUCTIVE TESTING TECHNIQUES

UNIT V LAWS OF SIMILITUDE
Laws of similitude - model materials – model testing – testing large scale structures – holographic techniques.

TOTAL HOURS: 45

TEXT BOOKS

REFERENCE BOOKS
OBJECTIVE:
At the end of this course the students should have learnt the irrigation system requirements, irrigation scheduling, strategies in water use management, canal operation places and involvement of stake holder

UNIT I. IRRIGATION SYSTEM REQUIREMENTS

UNIT II IRRIGATION SCHEDULING
Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III MANAGEMENT
Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV OPERATION
Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V INVOLVEMENT OF STAKE HOLDERS
Farmer’s participation in System operation – Water user’s associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL HOURS: 45

TEXT BOOKS

REFERENCES
OBJECTIVE:
At the end of this course, the students should have learnt the fundamentals of CAD, computer graphics, fundamentals of finite elements analysis, design and optimization and expert systems.

UNIT I  INTRODUCTION
Fundamentals of CAD - Hardware and software requirements -Design process - Applications and benefits.

UNIT II  COMPUTER GRAPHICS
Graphic primitives - Transformations -Wire frame modeling and solid modeling -Graphic standards – Drafting packages

UNIT III  STRUCTURAL ANALYSIS
Fundamentals of finite element analysis - Principles of structural analysis -Analysis packages and applications.

UNIT IV  DESIGN AND OPTIMISATION
Principles of design of steel and RC Structures -Applications to simple design problems – Optimisation techniques - Algorithms - Linear Programming – Simplex method

UNIT V  EXPERT SYSTEMS
Introduction to artificial intelligence - Knowledge based expert systems -Rules and decision tables – Inference mechanisms - Simple applications.

TOTAL HOURS: 45

TEXT BOOKS

REFERENCES
OBJECTIVE:
At the end of this course, the students should have learnt the pavement types, design of flexible & rigid pavements, performance evaluation and maintenance and stabilization of highway and rural roads.

UNIT I TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM 9
Introduction - Pavement as layered structure - Pavement types - rigid and flexible - Stress and deflections in pavements under repeated loading

UNIT II DESIGN OF FLEXIBLE PAVEMENTS 9
Flexible pavement design - Empirical - Semi empirical and theoretical Methods - Design procedure as per latest IRC guidelines – Design and specification of rural roads

UNIT III DESIGN OF RIGID PAVEMENTS 9
Cement concrete pavements - Modified Westergard approach - Design procedure as per latest IRC guidelines - Concrete roads and their scope in India.

UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE 9
Pavement Evaluation [Condition and evaluation surveys (Surface Appearance, Cracks, Patches And Pot Holes, Undulations, Ravelling, Roughness, Skid Resistance), Structural Evaluation By Deflection Measurements, Present Serviceability Index] Pavement maintenance. [IRC Recommendations Only]

UNIT V STABILISATION OF PAVEMENTS 9

TOTAL HOURS: 45

TEXT BOOKS

REFERENCES
OBJECTIVE:
At the end of this course, the students should have learnt the classification of rock masses and index properties, rock strength and failure criteria, estimation of engineering and rock bolt system.

UNIT I CLASSIFICATION AND INDEX PROPERTIES OF ROCKS 9
Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose.

UNIT II ROCK STRENGTH AND FAILURE CRITERIA 9
Modes of rock failure – Strength of rock – Laboratory and field measurement of shear, tensile and compressive strength – Stress strain behaviour in compression – Mohr-coulomb failure criteria and empirical criteria for failure – Deformability of rock.

UNIT III INITIAL STRESSES AND THEIR MEASUREMENTS 9
Estimation of initial stresses in rocks – influence of joints and their orientation in distribution of stresses – technique for measurements of insitu stresses.

UNIT IV APPLICATION OF ROCK MECHANICS IN ENGINEERING 9

UNIT V ROCK BOLTING 9

TOTAL HOURS: 45

TEXT BOOKS

REFERENCES
OBJECTIVE:

At the end of this course, the students should have learnt the design of various steel water tanks, concrete water tanks, steel bunkers and silos, concrete bunkers and silos and prestressed concrete water tanks.

UNIT I STEEL WATER TANKS

UNIT II CONCRETE WATER TANKS

UNIT III STEEL BUNKERS AND SILOS

UNIT IV CONCRETE BUNKERS AND SILOS

UNIT V PRESTRESSED CONCRETE WATER TANKS

TOTAL HOURS: 45

TEXT BOOKS

REFERENCES
OBJECTIVE:

At the end of this course, the students should have learnt the terminology of wind data, effect of wind in structures, chimneys, towers, bridges, application to design and introduction to wind tunnel.

UNIT I INTRODUCTION 9

UNIT II EFFECT OF WIND ON STRUCTURES 9
Static effect – Dynamic effect – Interference effects (concept only) – Rigid structure – Aeroelastic structure (concept only).

UNIT III EFFECT ON TYPICAL STRUCTURES 9
Tail buildings – Low rise buildings – Roof and cladding – Chimneys, towers and bridges.

UNIT IV APPLICATION TO DESIGN 9
Design forces on multistorey building, towers and roof trusses.

UNIT V INTRODUCTION TO WIND TUNNEL 9
Types of models (Principles only) – Basic considerations – Examples of tests and their use.

TOTAL HOURS: 45

TEXT BOOKS

REFERENCES
2. Wind Force on Structures – Course Notes, Building Technology Centre, Anna University, 2002.
OBJECTIVE:
At the end of this course, the students should have learnt the modern construction methods, methods for special structures, modern equipments used for excavation, conveyance etc and principles and practices of temporary structures.

UNIT - I MODERN CONSTRUCTION METHODS
Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT – II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES

UNIT - III MODERN CONSTRUCTION EQUIPEMENTS -I
Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting, Tunneling and hoisting.

UNIT – IV MODERN CONSTRUCTION EQUIPEMENTS -II
Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant.

UNIT – V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES
Principles and Practices of Temporary structures, Shoring, and Strutting, Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipments.

TOTAL HOURS: 45

TEXT BOOKS

REFERENCES
2. Nunnaly, S.W., Construction Methods and Management, Prentice – Hall, 2000