# Jharkhand University of Technology Jharkhand, Ranchi

## Proposed Syllabus for B.Tech 3rd Semester

## Computer Science & Engineering
## &
## Information Technology

## Computer Science & Engineering

3rd semester course structure

| Sl. No. | Course Code | Subject | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 01 | CS301 | Data Structures And Algorithms | 3 | 1 | 0 | 3 |
| 02 | IT301 | Object Oriented Programming | 3 | 1 | 0 | 3 |
| 03 | EC301 | Basic Electronics | 3 | 1 | 0 | 3 |
| 04 | EC302 | Digital Electronics And Logic Design | 3 | 1 | 0 | 3 |
| 05 | BSC301 | Mathematics-III | 3 | 1 | 0 | 4 |
| 06 | BSC302 | Environmental Science | 2 | 0 | 0 | 0 |
| | | | | | | |
| 01 | CS301P | Data Structures And Algorithms Lab | 0 | 0 | 3 | 1 |
| 02 | IT301P | Object Oriented Programming Lab | 0 | 0 | 3 | 1 |
| 03 | EC302P | Digital Electronics & Logic Design Lab | 0 | 0 | 3 | 1 |
| 04 | EX301 | Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project) | 0 | 0 | 2 | 1 |
| 05 | HS301 | Communication Skill Lab | 0 | 0 | 2 | 1 |
| **Total credit** | | | | | | **21** |

## Information Technology

3rd semester course structure

| Sl. No. | Course Code | Subject | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 01 | IT301 | Object Oriented Programming | 3 | 1 | 0 | 3 |
| 02 | CS301 | Data Structures And Algorithms | 3 | 1 | 0 | 3 |
| 03 | EC301 | Basic Electronics | 3 | 1 | 0 | 3 |
| 04 | EC302 | Digital Electronics And Logic Design | 3 | 1 | 0 | 3 |
| 05 | BSC301 | Mathematics-III | 3 | 1 | 0 | 4 |
| 06 | BSC302 | Environmental Science | 2 | 0 | 0 | 0 |
| | | | | | | |
| 01 | IT301P | Object Oriented Programming Lab | 0 | 0 | 3 | 1 |
| 02 | CS301P | Data Structures And Algorithms Lab | 0 | 0 | 3 | 1 |
| 03 | EC302P | Digital Electronics & Logic Design Lab | 0 | 0 | 3 | 1 |
| 04 | EX301 | Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project) | 0 | 0 | 2 | 1 |
| 05 | HS301 | Communication Skill Lab | 0 | 0 | 2 | 1 |
| **Total credit** | | | | | | **21** |

## PROPOSED SYLLABUS FOR CSE

## 2nd year, III Semester UG course Engg. & Tech Jharkhand University of Technology

**BSC301 MATHEMATICS III (CSE & IT)**

**Module -I**

**Laplace Transformation**: Laplace Transformation and its properties, Periodic function, Unit step function and impulse function .Inverse Laplace Transformation, Convolution Theorem, Applications of Laplace transforms in solving certain initial value problems & simultaneous differential equations**.** **(8L/1.5Q)**

**Module- II**

**Numerical Method**: Finite difference, Symbolic relations, Interpolation and Extrapolation, Newton - Gregory forward and backward formula, Lagrange's formula, Inverse Interpolation by Lagrange's formula. Numerical Differentiation and Numerical Integration, Newton Cotes Quadrature formula, Trapezoidal rule. Simpson's 1/3" rule, Simpson's 3/8" rule. **(10L/1.5Q)**

**Module -III**

**Fourier Series & Fourier Transform**: Expansion of - Algebraic, Exponential &Trigonometric functions in Fourier series, Change of interval, Even and odd function, half range sine and cosine series, Complex form of Fourier series.

Fourier Transformation and inverse Fourier Transformation, Fourier sine & cosine transforms. Convolution theorem for Fourier transforms with simple illustrations. **(8L/1Q)**

**Module- IV**

**Z-Transform & Inverse Z-Transform-** Properties - Initial and Final value theorems, Convolution theorem- Difference equations. Solution of difference equations using Z-Transformation. **(6L/1Q)**

**Module -V**

**Probability & Statistics:**

Moments, Skewness, Kurtosis. Correlation, coefficient of Correlation, Regression, linear only. Rank correlation. Sampling & Testing of Hypothesis-Null and alternate Hypothesis, level of significance, The t-distribution, The F-distribution & Chi-square tests. **(8L/1Q)**

**Note-Question no.1 will be compulsory, objective type with 7 sub-parts comprising of the whole syllabus.**

**Text Books**


**1.** Irwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,

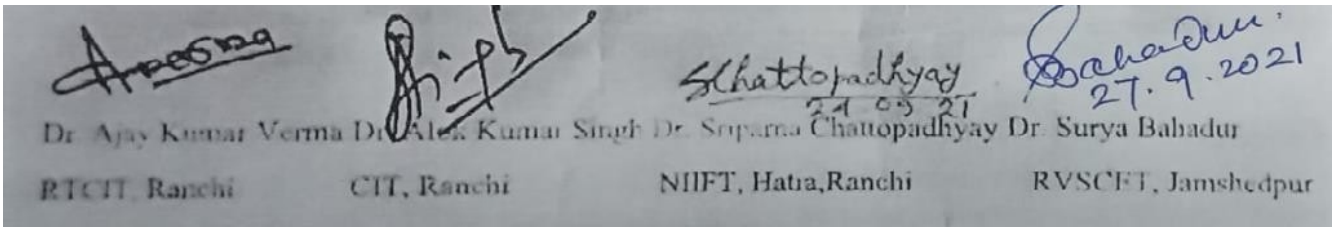
2. Ramana R. V ., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,2010.

3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition,


Reference Books


1. R. J. Beerends .H. G. Ter Morsche, J. C. Van Den Berg. L. M. Van De Vrie, Fourier and Laplace Transforms, Cambridge University Press.

2. Sastry S.S. Introductory Methods of Numerical Analysis, PHI

# BASIC ELECTRONICS

**(ECE, EEE, EE,CSE, IT) Course code -EC 301**

| L | T | P | CR. |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Module I**

## Basic Electronic Components

Active and Passive Components, Types of resistors and Colour coding, Capacitors, Inductors applications of Resistor, Capacitor and Inductor, Relay, LDR, Basic Integrated Circuits ( IC 7805, 7809, 7812, 555 etc.).Measuring Instruments like CRO, Power supply, Multi-meters etc.

**Module II**

## Semiconductors

Difference between Insulators, Semiconductors and Conductors, Mobility and Conductivity, Intrinsic and Extrinsic Semiconductors, Fermi Level, Energy band, Charge Densities in Semiconductors, Mass Action Law, Current Components in Semiconductors, Drift and Diffusion Current, The Continuity Equation, Injected Minority Charge Carrier, Hall Effect, P-N Junction Diode, construction, working, characteristics and diode equation Application of Diode, Rectifier: Half Wave, Full Wave and Bridge Rectifier, Zener Diode and its Applications, Varactor Diode, Schottky Diode, Regulated Power Supply using Zener Diode and Regulated ICs, LED, Photodetector.

**Module III:**

## Transistors

Construction, Working, Modes and Configuration of BJT, Input and Output Characteristics of all Configurations, Comparison of all Configuration & Modes, BJT as a Switch and as an Amplifier. JFET Construction, working and characteristics. MOSFET Construction, working and Characteristics, Types of MOSFET.

**Module IV: Power electronic devices &Communication engineering**

Construction, characteristics and working of SCR, DIAC, TRIAC and UJT. Introduction, Characteristics and applications of Operational Amplifier (Ic741). Modulation and its types.

**Module V: Digital Logic and basic circuit Design**

Number systems and conversion (DECIMAL, OCTAL, HEXADECIMAL,BINARY, BCD etc.),binary addition and subtraction, Logic Gates and their truth-table ,Boolean algebra .Design of Single Stage Amplifier, LED Driver Circuit, Infrared Transmitter Receiver Circuit, LDR Driver Circuit, Relay Driver Circuit, Square Wave and Fix Frequency Generator using 555 IC.

**Text Books**

1. Basic Electronics and Linear Circuits by N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta, TMH Publications.
2. Op-Amps and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI Publications.
3. Electronic Devices and Circuits by Godse and Bakshi Technical, Vol-1 Technical Publication Pune.

**Reference Books**

1. Integrated Devices & Circuits by Millman & Halkias, TMH Publications.
2. Electronics Devices and Circuit Theory by R. Boylestad & L. Nashelsky, Pearson Publication 3. Electronic Communication System by G. Kennedy, TMH Publications.
4. Basic Electronics by Sanjeev Kumar & Vandana Sachdeva, Paragaon International Publication

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# DATA STRUCTURES AND ALGORITHMS

**(CSE, IT) Course**
**code -CS 301**

(3-CREDIT) (L-T-P/3-0-0)

**Module I**

Basic concepts and notations: Data structures and data structure operations, Complexity Analysis: Mathematical notation and functions, algorithmic complexity and time space trade off, Big O Notation, The best, average & worst cases analysis of various algorithms. Arrays: Linear & Multidimensional Arrays, Representation & traversal. Sorting algorithms: Bubble sort, Selection sort, Insertion sort, Merge sort and Quick sort, Counting Sort. Linear search and Binary search on sorted arrays.

**Module II**

Abstract Data Types (ADTs) Stack: Push; Pop, stack representation using array and linked list, Applications of Stack, Recursion. Queue: Representation using array and linked list, Insertion and deletion operations, circular queue, Dequeue, priority queue. Linked Lists & their types (Single, Double, Circular linked lists), Operations on Varieties of Linked Lists (Search and Update) with applications

**Module III**

Introduction to Trees, Binary tree - definitions and properties; binary tree traversal algorithms with and without recursion., Binary Search Tree - creation, insertion and deletion operations, Threaded tree (One way and Two way). AVL tree balancing; B-tree

**Module IV**

Graph Algorithms: Graphs and their Representations, Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS), Applications of BFS and DFS, Minimum Spanning Trees (MST), Prim's and Kruskal's algorithms for MST, Connected Components, Dijkstra's Algorithm for Single Source Shortest Paths,, Floydd's Algorithm for All-Pairs Shortest Paths Problem

**Module V**

Hashing techniques, Hash function, Address calculation techniques- common hashing functions Collision resolution, Linear probing, quadratic probing, double hashing, Bucket addressing. Rehashing

**Course Outcomes: At the end of the course the student will be able to:**

- Understand the concept of ADT
- Identify data structures suitable to solve problems
- Develop and analyze algorithms for stacks, queues
- Develop algorithms for binary trees and graphs
- Implement sorting and searching algorithms
- Implement symbol table using hashing techniques

**Text Books:**

1. Data Structures Using C – A.M. Tenenbaum (PHI)
2. Introduction to Data Structures with Applications by J. Tremblay and P. G. Sorenson (TMH)
3.Data Structures, Algorithms and Application in C, 2nd Edition, Sartaj Sahni
4. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.

**REFERENCE BOOKS:**

1. Data Structure and Program Design in C by C.L. Tondo.
2. Data Structures with C++, J. Hubbard, Schaum's Outlines, TMH.
3. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.
4. Data Structures and Algorithm Analysis in C, 3rd Edition, M.A. Weiss, Pearson.
5. Classic Data Structures, D. Samanta, 2nd Edition, PHI.
6. Data Structure Using C by Pankaj Kumar Pandey.
7. Data Structure with C, Tata McGraw Hill Education Private Limited by Seymour Lipschutz.
8. Data Structure through C in Depth, BPB Publication, by S.K. Srivastava.
9. Data Structure and algorithm Analysis in C 2nd Edition, PEARSON Publishing House, Mark Allen Weiss

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# OBJECT ORIENTED PROGRAMMING

**(CSE, IT) Course**
**code -IT 301**
(3-CREDIT) (L-T-P/3-0-0)

**Course Outcome:**

1. To be able to apply an object-oriented approach to programming and identify potential benefits of object-oriented programming over the approaches.
2. To be able to reuse the code and write the classes which work like built in types.
3. To be able to design applications which are easier to debug, maintain and extend.
4. To be able to apply object-oriented concepts in real world applications.
5. To be able to develop applications using multi-threading.
6. To be able to handle exceptions in any applications.

## Module-I 12 Hrs

Introduction to Java and Java Programming Environment, Object Oriented Programming, Fundamental Programming Structure: Data Types, Variable, Typecasting Arrays, Operators and their Precedence. Control Flow: Java's Selection Statements (if, Switch, Iteration, Statement, While, Do While, for, Nested Loop). Concept of Objects and Classes, Using Exiting Classes Building your own Classes, Constructor Overloading, Static, Final this Keyword, Inheritance: Using Super to Call Super Class Constructor, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using Final with Inheritance. The Object Class Packages & Interfaces: Packages, Access Protection, Importing Package, Interface, Implementing Interfaces, Variables in Interfaces, Interfaces can be Extended. Exception Handling: Fundamentals, Types Checked, Unchecked Exceptions, Using Try & Catch, Multiple Catch, Throw, Throws, Finally Java's Built in Exceptions, User Defined Exception.

## Module-II 12 Hrs

Multi-Threading: Java Thread Model, Thread Priorities, Synchronization, creating a Thread, Creating Multiple Threads, Using is Alive () and Join () Wait () & Notify (). String Handling: String Constructors, String Length, Character Extraction, String Comparison, Modifying a String. Java I/O: Classes & Interfaces, Stream Classes, Byte Streams, Character Streams, Serialization, JDBC: Fundamentals, Type I, Type II, Type III, Type IV Drivers. Networking: Basics, Socket Overview, Networking Classes, & Interfaces, TCP/IP Client Sockets, Whois, URL Format, URL Connection, TCP/IP Server Sockets.

**Module-III 12 Hrs**

Applets: Basics, Architecture, Skeleton, The HTML APPLET Tag, Passing Parameters to Applets, Applet Context and Show Documents (). Event Handing: Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter Classes. AWT: AWT Classes Window Fundamentals, Component, Container, Panel Window, Frame, Canvas, Creating a Frame Window in an Applet, Working with Graphics, Control Fundamentals, Layout Managers, Handling Events by Extending AWT Components. Core Java API package, reflection, remote method invocation (RMI) swing applet, icons & labels, text fields, Buttons, combo boxes, tabbed panes, scroll panes, trees, tables exploring Java-language: Simple type wrappers, runtime memory management, object fusing clone () and the cloneable interface, thread, thread group, runnable.

**TEXT BOOK:**

1. Introduction to Java Programming: Liang, Pearson Education, 7th Edition.
2. Java the Complete Reference: Herbert Schildt, TMH, 5th Edition.

**REFERENCE BOOKS:**

1. Balguruswamy, Programming with Java, TMH.
2. Programming with Java: Bhave&Patekar, Person Eduction.
3. Big Java: Horstman, Willey India, 2nd Edition.
4. Java Programming Advanced Topics: Wigglesworth, Cengage Learning.

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# DIGITAL ELECTRONICS AND LOGIC DESIGN

**(ECE, CSE, IT)**

**Course code -EC 302**

| L | T | P | CR. |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Module I: Binary Codes and Boolean algebra**

Analog and Digital, Binary Number System. Addition, Subtraction, Multiplication, Division of binary numbers, Subtraction using 2's complement method. Binary codes: weighted and non weighted codes, self complementary codes, BCD, Excess-3, Gray codes, Alphanumeric codes, ASCII Codes. *Boolean algebra*: Boolean Laws and Expression using Logic Gates, Realization of different gates using Universal gates, DeMorgan's Theorem, Duality Theorems.

**Module II: Boolean function minimization Techniques**

Standard forms: SOP, POS, Simplification of Switching function & representation (Maxterm & Minterm), Boolean expression & representation using logic gates, Propagation delay in logic gate. *Karnaugh map*: K-map(up to 5 variables), mapping and minimization of SOP and POS expression, Don't care condition, conversion from SOP to POS and POS to SOP form using K-map, Minimization of multiple output circuits, Quine Mc-cluskey method minimization technique, prime implicant table, Don't care condition.

**Module III: Combinational Circuits Design**

Adder & Subtractor (Half and Full), Parallel Binary adder, BCD Adder, Binary multipliers, Code Converters, parity bit generator, Comparators, Decoder, BCD to 7-segment Decoder, Encoders, Priority Encoders, Multiplexers, De Multiplexers.

**Module IV: Sequential Circuits Elements**

Introduction to sequential circuit, Flip-flop & Timing Circuits: SR latch, Gated latch, Tri state logic, Edge triggered flip-plop: - D, JK, T Flip-flop, flip-flop asynchronous inputs ,characteristic table of Flip-flop, excitation table of Flip-flop, master slave JK flip flop, inter conversion of Flip-flop. Study of timing parameters of flip-flop. Shift registers: buffer register, controlled buffer register. Data transmission in shift resistor SISO, SIPO, PISO, PIPO, Bidirectional shift register, universal shift registers. *Counter*: Classification, Ripple or asynchronous counter, Effect of propagation delay in ripple counters, up-down counter, Design of Mod-n counter, synchronous counter, Ring counter, Johnson counter. Introduction to FSM. Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator.

**Module V: Logic Families and VLSI Design flow**

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA, Logic implementation using Programmable Devices VLSI Design flow: Design entry, Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits

***Text Books* :**

1. Kharate "Digital Electronics" OXFORD Publication
2. A. Anand Kumar 'Fundamentals of Digital Circuits'. PHI Publications

3. R.P. Jain-'Modern Digital Electronics' IIIrd Edition- Tata Mc Graw Hill, Publication
4. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition
6. Bhaskar VHDL BASED DESIGN ,PEARSON EDUCATION

***Reference Books:***

1. Rajkamal 'Digital Systems Principals and Design' Pearson Education
2. A.P. Malvino, D.P. Leach 'Digital Principles & Applicatios' -VIth Edition-TMH publication.
3. M. Morris Mano 'Digital Design' (Third Edition). PHI Publications

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# ENVIRONMENTAL SCIENCE

**Course code – BSC 302**

**L T P CR.**

**2 0 0 0**

**(COMMON FOR ALL BRANCH)**

**Module-1**

Concept and scope of Environment science, components of environment, environmental segment and their importance. **(2 Hrs)**

**Module-II**

Ecology: Ecosystem and its characteristics features, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem, ecological balance and consequences of imbalance. **(4 Hrs)**

**Module-III**

Atmosphere: Atmospheric composition, energy balance, climate, weather, depletion of ozone layer, green house effect, acid rain, particles, ions and radicals in the atmosphere, chemical and photochemical reactions in the atmosphere.

**Module-IV** **(4 Hrs)**

Air pollution and control: Air pollutants, sources and effect of air pollutants, primary and secondary pollutants, photochemical smog, fly ash, inorganic and organic particulate matter. Air quality standards, sampling, monitoring and control measures for pollutants. **(4 Hrs)**

**Module-V**

Water pollution and control: Aquatic environment, water pollution, sources and their effect, lake and ground water pollution, eutrophication, water quality standard and water pollution control measures, waste water treatment.

**Module-VI** **(4 Hrs)**

Land pollution; Lithosphere, composition of soil, acid base and ion exchange reactions in soil, soil erosion, landslides, desertification, pollutants (municipal, industrial, commercial, agricultural ,

hazardous solid wastes), origin and effects, collection and disposal of solid wastes, recovery and conversion methods. **(5 Hrs)**

**Module-VII**

Noise pollution; Noise classification and its sources, effects and measurement, noise pollution hazards, standards and noise pollution control. **(2 Hrs)**

**Books and References:**


1. Master, G.M Introduction to environment engineering and science, Pearson Education.
2. Nebel, B.J., Environment science, Prentice Hall Inc.
3. Odum, E.P. Ecology: The link between the natural and social sciences. IBH Publishing Company Delhi
4. De, A.K. Environmental Chemistry, Merrut.
5. Sharma B.K Envrionmental Chemistry, Krishna Prakashan Media Merrut.
6. Kaushik, A and Kaushik, C.P. Perspectives in Environmental studies, New Age International Publication.
7. Menon, S.E. Environmental Chemistry.


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# DATA STRUCTURE LAB

**(CSE, IT) Course code**
**-CS 301P**

***Course Objective:*** The objective is to develop linear and non-linear data structure, express different operation on AVL tree, evaluate infix to postfix expression, and apply searching and sorting algorithms in real life applications.

1. C Programs on :
   - Bubble sort
   - Selection sort
   - Insertion sort,
   - Quick sort
   - Heap sort, Merge Sort
2. C Programs on :
   - Sequential Search
   - Binary Search
3. Write a C Program to create a stack using an array and perform
   - Push operation , Pop operation
4. Write a C Program that uses Stack Operations to perform the following:-
   - Converting an infix expression into postfix expression
   - Evaluating the postfix expression

5. Write a C Program to create a queue and perform
   - Push, Pop, Traversal
6. Write a C Program that uses functions to perform the following operations on a single linked list : i)Creation, ii) Insertion, iii) Deletion, iv) Traversal
7. Write a C Program that uses functions to perform the following operations on a double linked list: i)Creation, ii) Insertion, iii) Deletion
8. Write a C Program that uses functions to perform the following operations on a Binary Tree :i) Creation, ii) Insertion, iii) Deletion
9. Write a C Program for Single Source Shortest Paths using Dijkstra's Algorithm
10. Write a C Program for All-Pairs Shortest Paths using Floydd's Algorithm

**NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.**

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## OBJECT ORIENTED PROGRAMMING LAB

**(CSE, IT) Course**
**code -IT 301P**

**Course Outcome:**

1. Able to do program in object-oriented concept.
2. Able to create user defined exception.
3. Able to create GUI.
4. Able to understand JDBC and ODBC concept.

**To do various Java Programs on:**

1. Introduction, compiling & executing a Java program.
2. Data types & variables, decision control structures: if, nested if etc.
3. Loop control structures: do while, for etc.
4. Classes and objects.
5. Data abstraction & data biding, inheritance, polymorphism.
6. Using concept of package.
7. Threads, exception handlings and applet programs.
8. Interfaces and inner classes, wrapper classes, generics.
9. Programs on JDBC.
10. Creating GUI.

**NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus**

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## DIGITAL ELECTRONICS AND LOGIC DESIGN LAB

**(ECE, EEE,EE,CSE, IT)**
**Course code EC 302P**

**List of Experiments (Minimum 10)**

1. Study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design & realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer & Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R, J-K, T & D type flip flops.
6. To verify the operation of bi-directional shift register.
7. To design & verify the operation of 3-bit synchronous counter.
8. Design all gates using VHDL.
9. Design a multiplexer using VHDL
10. Design a decoder using VHDL
11. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. half adder b. full adder
12. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. multiplexer b. demultiplexer

**NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus. For VHDL Xilinx software may be used.**

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## COMMUNICATION SKILL LAB

**Course code** HS301

**This lab paper involves interactive practice sessions in Language Lab along with some class lectures to enable the students to be confident enough in language and professional sphere of life.**

**Module I: Listening Comprehension**

To comprehend spoken material in standard Indian English/ British English & American English

- Current situation in India regarding English
- American English Vs. British English

**Module II: Phonetics & Phonology**

- Introduction to Phonetics & Phonology
- Organs of Speech/ Speech Mechanism
- Pronunciation, Intonation**,** Stress and Rhythm, Syllable division
- Consonants/Vowels/Diphthongs Classification

**Module III: Common Everyday Situations: Conversations and Dialogues**
**Module IV: Communication at Workplace**
**Module V: Telephonic Conversation**

- Introduction
- Listening/Speaking
- Telephonic Skills Required
- Problems of Telephonic Conversation
- Intensive Listening

**Module VI: Interviews**

- The Interview Process
- Purpose/Planning/Two-way Interaction/Informality
- Pre-interview Preparation Techniques
- Projecting a Positive Image
- Answering strategies

**Module VII: Formal Presentations**

- Introduction
- Nature/Importance of Presentation
- Planning
- Objective with central idea, main ideas, role of supporting materials
- Handling Stage Fright

**Module VIII: Forms of Technical Communication:** Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

**Module IX: Technical Presentation:** Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

**Module X: Technical Communication Skills:** Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means.

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# Jharkhand University of Technology Jharkhand, Ranchi

## Proposed Syllabus for B.Tech 4th Semester

## Computer Science & Engineering
## &
## Information Technology

## Computer Science & Engineering

4th semester course structure

| Sl. No. | Course code | Subject | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 01 | CS401 | Operating System | 3 | 1 | 0 | 3 |
| 02 | CS402 | Design And Analysis Of Algorithms | 3 | 1 | 0 | 3 |
| 03 | CS403 | Formal Language And Automata Theory | 3 | 1 | 0 | 3 |
| 04 | BSC401 | Discrete Mathematics | 3 | 1 | 0 | 3 |
| 05 | IT401 | Database Management Systems | 3 | 1 | 0 | 3 |
| 06 | EN401/ IT402 | Engineering Economics / Cyber Security | 2 | 0 | 0 | 0 |
| | | | | | | |
| 01 | CS401P | Operating System Lab | 0 | 0 | 3 | 1 |
| 02 | CS402P | Design And Analysis Of Algorithms Lab | 0 | 0 | 3 | 1 |
| 03 | CS403P | Formal Language And Automata Theory Lab | 0 | 0 | 3 | 1 |
| 04 | EX401 | Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project) | 0 | 0 | 2 | 1 |
| 05 | IN401 | Internship/ Tour & Training/Industrial Training | 0 | 0 | 0 | 2 |
| **Total credit** | | | | | | **21** |

## Information Technology

4th semester course structure

| Sl. No. | Course code | Subject | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 01 | IT401 | Database Management Systems | 3 | 1 | 0 | 3 |
| 02 | CS401 | Operating System | 3 | 1 | 0 | 3 |
| 03 | CS402 | Design And Analysis Of Algorithms | 3 | 1 | 0 | 3 |
| 04 | CS403 | Formal Language And Automata Theory | 3 | 1 | 0 | 3 |
| 05 | BSC401 | Discrete Mathematics | 3 | 1 | 0 | 3 |
| 06 | EN401/ IT402 | Engineering Economics / Cyber Security | 2 | 0 | 0 | 0 |
| | | | | | | |
| 01 | CS401P | Operating System Lab | 0 | 0 | 3 | 1 |
| 02 | CS402P | Design And Analysis Of Algorithms Lab | 0 | 0 | 3 | 1 |
| 03 | CS403P | Formal Language And Automata Theory Lab | 0 | 0 | 3 | 1 |
| 04 | EX401 | Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project) | 0 | 0 | 2 | 1 |
| 05 | IN401 | Internship/ Tour & Training/Industrial Training | 0 | 0 | 0 | 2 |
| **Total credit** | | | | | | **21** |

# OPERATING SYSTEM

## Course Code- CS401

(3-CREDIT) (L-T-P/3-1-0)

**Module - I**

**OPERATING SYSTEMS OVERVIEW:** Introduction, Evolution of operating system, operating system operations, operating system structure, System Calls, Types of System Calls

**Modul – II**

**PROCESS MANAGEMENT:** Process concepts, process state, process control block, scheduling queues, process scheduling, Interposes Communication, Threads and implementation of threads.

**CPU SCHEDULING:** Objective and Criteria, CPU scheduling algorithms: FCFS, SJF, Priority Scheduling, Round robin, multilevel queue scheduling and multilevel feedback queue scheduling.

**Modul- III**

**CONCURRENCY AND SYNCHRONIZATION**: Process synchronization, critical section problem, and its solutions. Semaphores, classical problems of synchronization: readers and writers problem, dining philosophers problem, sleeping barber problem.

**Modul- IV**

**DEADLOCKS:** Introduction, deadlock characterization, Resource allocation graph, Methods for Handling Deadlocks: deadlock prevention, avoidance and deadlock detection, recovery from deadlock.

**Modul V**

**MEMORY MANAGEMENT:** Introduction, memory allocation techniques, paging, implementation of paging, segmentation and its implementation, segmentation with paging, virtual memory, demand paging, page-replacement algorithms, thrashing and its solution.

**Modul VI**

**FILE SYSTEM:** Concept of a file, access methods, directory structure, file system mounting, file sharing, protection. File system implementation: file system structure, directory implementation, allocation methods, free-space management, efficiency and performance.

**Mass-Storage Structure:** Overview of mass storage structure, disk structure, disk scheduling algorithms,

**TEXT BOOKS:**

1. **ABRAHAM SILBERSCHATZ, PETER BAER GALVIN, GREG GAGNE (2012)**, Operating System Principles, 9th edition, Wiley India Private Limited, New Delhi.

**REFERENCE BOOKS:**

1. **William Stallings**, Operating Systems, Internals and Design Principles, 7th edition, Pearson Education, India. 2.
2. **Andrew S. Tanenbaum (2007)**, Modern Operating Systems, 2nd edition, Prentice Hall of India, India. 3. Deitel & Deitel (2008), Operating systems, 3rd edition, Pearson Education, India.

**COURSE OVERVIEW:**

Operating systems course is intended as a general introduced to the techniques used to implement operating systems and related kinds of systems software. The topics covered will be functions and structure of operating systems, process management (creation, synchronization, and communication); processor scheduling; deadlock prevention, avoidance, and recovery; main-memory management; virtual memory management (swapping, paging, segmentation and page-replacementalgorithms); control of disks and other input/output devices; file-system structure and implementation; and protection and security

**COURSE OBJECTIVES:**

- To explain main components of OS and their working.
- To familiarize the operations performed by OS as a resource Manager.
- To impart various scheduling policies of OS.
- To teach the different memory management techniques.

**COURSE OUTCOMES:** At the end of the course students will be able to the following

- Outline various concepts and features of Operating systems.
- Compare various operating systems with respect to characteristics and features.
- Implement algorithm of CPU Scheduling, Memory Management and disk scheduling.
- Make changes in the OS configurations as per need.

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# DESIGN AND ANALYSIS OF ALGORITHM

**Course Code- CS402**

(3-CREDIT) (L-T-P/3-1-0)

**Course Outcome:**

1. Ability to analyze the performance of algorithms.
2. Ability to choose appropriate algorithm design techniques for solving problems.
3. Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs.

**MODULE-I**

**INTRODUCTION & ANALYSIS:**

Analyzing Algorithms, Recurrence Equations, Growth Function: Asymptotic Notation, Standard Notation & Common Functions, Recurrence Relation, Different Methods of Solution of Recurrence Equations with Examples.

**MODULE-II**

**DIVIDE AND CONQUER & BACKTRACKING PARADIGM:**

Introduction to Divide and Conquer Paradigm, Quick and Merge Sorting Techniques, Linear Time Selection Algorithm, The Basic Divide and Conquer Algorithm for Matrix Multiplication, Backtracking & Recursive Backtracking, Applications of Backtracking Paradigm, Heaps.

**MODULE-III**

**GREEDY PARADIGM & DYNAMIC PROGRAMMING:**

Greedy Paradigm: The Basic Greedy Strategy & Computing Minimum Spanning Trees, Algorithms of Kruskal and Prim, Union to Find Algorithm & Their Applications, Disjoint Set, The Relationship in Dijkstra's and Prim's Algorithms, Use of Greedy Strategy in Algorithms for the Knapsack Problem and Huffman Trees. The Basic Dynamic Programming Paradigm, Dynamic Programming

Solution to the Optimal Matrix Chain Multiplication and the Longest Common Subsequence Problems.

**MODULE-IV**

**GRAPHS ALGORITHMS & STARING MATCHING ALGORITHMS:**

Representational Issues in Graphs, Depth First Search & Breath First Search on Graphs, Computation of Bi-connected Components and Strongly Connected Components Using DFS, Topological Sorting & Applications, Shortest Path Algorithms on Graphs: Bellman-Ford Algorithm, Dijkstra's Algorithm & Analysis of Dijkstra's Algorithm Using Heaps, Floyd-Warshall's all Pairs Shortest Path Algorithm and its Refinement for Computing the Transitive Closure of a Graph. The General String Problem as a Finite Automata, Kunth Morris and Pratt Algorithms.

**MODULE-V**

**NP-COMPLETE PROBLEMS:**

Solvable Problems, Types of Problems, The Notion of a Non-Deterministic Algorithm and its Basic Relationship to Backtracking, Polynomial Time Non-Deterministic Algorithms for Problems Like Satisfiability, Clique Problem, Hamiltonian Path Problems etc. The Definition of NP-Hardness and NP-Completeness, The Statement of Cook's Theorem and a Discussion of its Implication, The Notion of Polynomial Transformation, Vertex Cover, Subset Sum and Hamiltonian Cycle Problems are NP-Complete, Other Models for Computations.

**Text Books:**

1. Introduction to Algorithms (Second Edition); Cormen, Leserson, Rivert; PHI.
2. Fundamentals of Algorithms, Sahni& Horowitz; Galgotia.

**Reference Books:**

1. The Design & Analysis of Computer Algorithms, Hopcroft-Aho-Ullman, AWL.
2. Handbook of Algorithms & Data Structures, G.H. Gonnet, AWL.
3. Introduction to Design & Analysis of Algorithms, Levitin, PE-LPE.

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# FORMAL LANGUAGES AND AUTOMATA THEORY

**Course Code- CS403**

(3-CREDIT) (L-T-P/3-1-0)

**Module I: Fundamentals & Finite Automata:**

Alphabet, Strings, Language, Operations, Mathematical proving techniques, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, Deterministic Finite Automaton (DFA) and Non deterministic Finite Automaton (NFA), transition diagrams and Language recognizers. Equivalence of DFA and NFA, NFA to DFA conversion, NFA with $\varepsilon$ - transitions - Significance, acceptance of languages. Equivalence between NFA with and without $\varepsilon$ -

transitions, minimization of FSM, Finite Automata with output- Moore and Mealy machines and conversion of Mealy to Moore and vice-versa.

**Module II: Regular Expression and Languages:**

Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Regular grammars-right linear and left linear grammars, conversion of right linear grammar to left linear and vice-versa, equivalence between regular grammar, regular expression and FA, Pumping lemma of regular sets, closure properties of regular sets.

**Module III: Context Free Grammars and Push Down Automata:**

Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings. Ambiguity in context free grammars. Reduction of Context Free Grammars. Chomsky normal form(CNF), Greiback normal form(GNF), Pumping Lemma for Context Free Languages. Simplification of CFL.

Push down automata(PDA) definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFG and PDA, interconversion. Introduction to DCFL and DPDA. DPDA Vs NPDA.

**Module IV: Turing Machine:**

Turing Machine definition, representation of Turing Machines model, Variants of TM, design of TM, linear bounded automata,

**Module V: Computational Complexity & Decidability, Recursively Enumerable Languages:**

**Complexity :** Growth rate of a function, class P and NP, polynomial time reduction and NP-Completeness, NP-Complete problems(SAT, CSAT,Hamiltonian circuit, travelling salesman, vertex cover). **Decidability:** decidability, decidable language, undecidable language, halting problem of Turing Machine.**Computability:** primitive recursive function and recursive function.

**TEXT BOOKS:**

1. Theory of Computer Science (Automata Language and Computation) K.L.P. Mishra and N. Chandrasekran, PHI.
2. Introduction to Automata Theory, Language and Computation, John E, Hopcropt and Jeffery D. Ullman, Narosa Publishing House.

**REFERENCE BOOKS:**

1. Theory of Automata and Formal Language, R.B. Patel & P. Nath, Umesh Publication.
2. An Introduction and Finite Automata Theory, Adesh K. Pandey, TMH.
3. Theory of Computation AM Natrajan, Tamilarasi, Bilasubramani, New Age International Publishers, Chhattisgarh Swami Vivekan.
4. An introduction to Formal Languages and Automata by Peter Linz, Narosa Publ

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# DATABASE MANAGEMENT SYSTEMS

**Course Code- IT401**

## Module I

Introduction: Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.

## Module II

**Relational data Model and Language**: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQl Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL

## Module III

**Data Base Design & Normalization**: Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design

## Module IV

**Transaction Processing Concept:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.

## Module V

**Concurrency Control Techniques:** Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.

**References:**

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
2. Date C J, "An Introduction to Database Systems", Addision Wesley
3. Elmasri, Navathe, " Fundamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.
5. RAMAKRISHNAN"Database Management Systems",McGraw Hill
6. Leon & Leon,"Database Management Systems", Vikas Publishing House
7. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
8. Majumdar & Bhattacharya, "Database Management System", TMH
9. R.P. Mahapatra, Database Management System, Khanna Publishing House

# DISCRETE MATHEMATICS

**Course Code- BSC401**

(3-CREDIT) (L-T-P/3-1-0)

**MODULE-I**

**Mathematical Logic:**

Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

**MODULE-II**

**Set Theory:**

Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

**Algebraic Structures:**

Introduction, Algebraic Systems, Semi Groups and Monoids, Groups, Lattices as Partially Ordered Sets, Boolean Algebra.

**MODULE-III**
**Elementary Combinations:**

Basic of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multi-Nominal Theorems, The Principle of Inclusion-Exclusion.

**MODULE-IV**
**Recurrence Relations:**

Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, The Method of Characteristic Roots, Solutions of Inhomogeneous Recurrence Relations.

**MODULE-V**

**Graphs and Trees:**

Basic Concepts, Isomorphisms and Subgraphs, Trees and Their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

**TEXT BOOKS:**

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay, R. Manohar, McGraw Hill Education (India) Private Limited (Units-I, II).
2. Discrete Mathematics for Computer Scientists & Mathematicians, Joe L. Mott, Abraham Kandel, Theodore P. Baker, Pearson, 2nd Edition (Units- III, IV, V).

**REFERENCE BOOKS:**

1. Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th Edition, McGraw Hill Education (India) Private Limited.
2. Discrete Mathematics D.S. Malik & K. K. Sen, Revised Edition Cengage Learning.
3. Elements of Discrete Mathematics, C.L. Liu and D.P. Mohapatra, 4th Edition, McGraw Hill Education (India) Private Limited.
4. Discrete Mathematics with Applications, Thomas Koshy, Elsevier.
5. Discrete and Combinatorial Mathematics, R. P. Grimaldi, Pearson.
6. Discrete Mathematical Structures by Bernard Kolman, Robert C. Busby and Sharon Cutler Ross, Pearson Education.

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# CYBER SECURITY

**Course code –IT 402**

**Module I: Introduction to Cybercrime :** Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

**Module II: Cyber Offenses**: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

**Module III: Cybercrime :** Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices:

Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

**Module – IV: Tools and Methods Used in Cybercrime :** Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

**Module V: Cyber Security :** Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

**TEXT BOOK:**

- Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

**REFERENCE BOOK:**

- Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
- Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

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# ENGINEERING ECONOMICS

**Course code –EN 401**

**COURSE OUTLINE:**
The basic purpose of this course is to provide a sound understanding of concepts and principles of engineering economy and to develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.

**Module -1**

**Introduction of Engineering Economics and Demand Analysis**: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, practical importance & applications of the concept of elasticity of demand.

**Module -II**

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Various concepts of cost – Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost, Cost curves.

**Module III**

Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Pricing Policies- Entry Deterring policies, Predatory Pricing, Peak load Pricing. Product Life cycle

Firm as an organisation- Objective of the Firm, Type of the Firm, Vertical and Horizontal Integration, Diversification, Mergers and Takeovers.

**Module -IV**

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization – meaning, merits and demerits. Globalisation of Indian economy – merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, Business cycle, Inflation

**RECOMMENDED BOOKS:-**

1. R.Paneer Seelvan: Engineering Economics, PHI
2. Managerial Economics, D.N.Dwivedi, Vikash Publication
3. Managerial Economics, H.L. Ahuja, S. Chand and Co. Ltd.
4. Managerial Economics, Suma Damodaran, Oxford.
5. R.molrishnd Ro T.V S 'Theory of firms : Economics and Managerial Aspects'. Affiliated East West Press Pvt Ltd New Delhi
6. Managerial Economics, H. Craig Petersen &W. Cris Lewis, Pearson Education.

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# DESIGN AND ANALYSIS OF ALGORITHM LAB

**Course Code- CS402P**

**Course Outcome:**

1. Able to Analyze the Real World Problem and Solv it.
2. Able to analyze Any Algorithm in Terms of Complexity.
3. Able to Compare Different Sorting Algorithm.

4. Able to Design Algorithm by Following Different Approach.

**list of experiments:**

1. Using a Stack of Characters, Covert an Infix String of Postfix String (I Class)
2. Implement Insertion, Deletion, Searching of a BST, (I Class)
3. (a) Implement Binary Search and Liner Search in a Program.
   (b) Implement a Heap Sort Using a Max Heap.
4. (a) Implement DFS/BFS for a Connected Graph.
   (b) Implement Dijkstra's Shortest Path Algorithm Using BFS.
5. (a) Write a Program to Implement Huffman's Algorithm.
   (b) Implement MST Using Kruskal/Prim Algorithm
6. (a) Write a Program on Quick Sort Algorithm.
   (b) Write a Program on Merge Sort Algorithm.
   Take Different Input Instance for Both the Algorithm and Show the Running Time.
7. Implement Matrix Chain Order Algorithm.
8. Write Down a Program to Find Out a Solution for 0/1 Knapsack Problem.
9. Using Dynamic Programming Implement LCS.
10. (a) Find Out the Solution on the N-Queen Problem.
    (b) Implement Back Tracking Using Game Trees.

**NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus**

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# OPERATING SYSTEM LAB

**Course Code- CS401P**

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP, WINDOWS7/8

2. Execute various UNIX system calls for i. Process management ii. File management iii. Input/output Systems calls

3. Implement CPU Scheduling Policies: i. SJF ii. Priority iii. FCFS iv. Multi-level Queue

4. Implement file storage allocation technique: i. Contiguous(using array) ii. Linked –list(using linked-list) iii. Indirect allocation (indexing)

5. Implementation of contiguous allocation techniques: i. Worst-Fit ii. Best- Fit iii. First- Fit

6. Calculation of external and internal fragmentation i. Free space list of blocks from system ii. List process file from the system

7. Implementation of compaction for the continually changing memory layout and calculate total movement of data

8. Implementation of resource allocation graph RAG)

9. Implementation of Banker‟s algorithm

10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.

11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communication techniques-Semaphores

12. Implement the solutions for Readers-Writers problem using inter process communication technique -

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# FORMAL LANGUAGES AND AUTOMATA THEORY

**Course Code- CS403P**

1. Write a program for Pattern searching ?
2. Write a program to simulate Nondeterministic Finite Automata (NFA)
3. Write a program to simulate deterministic Finite Automata (DFA)
4. Write a Program to remove Useless Production in a C.F.G
5. Write a Program to remove Unit Productionin a C.F.G
6. Create a pushdown automata for string translation

## Syllabus for B. Tech course in Computer Science & Engineering and Information Technology

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**Course Structure for 5th and 6th Semester CSE**

| Sl. No | Course Code | Category | Subject | L | T | P | Credit |
|---|---|---|---|---|---|---|---|
| **1** | CSC501 | Professional Core-I | Computer Organization and Architecture | 3 | 1 | 0 | 4 |
| **2** | CSC502 | Professional Core-II | Compiler Design | 2 | 1 | 0 | 3 |
| **3** | CSC503 | Professional Core-III | Computer Graphics | 2 | 1 | 0 | 3 |
| **4** | | Professional Electives-I | List of Professional Electives-I | 2 | 1 | 0 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | | Open Elective-1 | List of Open Elective-1 | 2 | 1 | 0 | 3 |
| **Laboratory/Sessional** | | | | | | | |
| 1 | CS501P | Laboratory-I | Computer Organization and Architecture Lab. | 0 | 0 | 2 | 1 |
| 2 | CS502P | Laboratory-II | Compiler Design Lab. | 0 | 0 | 2 | 1 |
| 3 | CS503P | Laboratory-III | Computer Graphics Lab. | 0 | 0 | 2 | 1 |
| 4 | CS504P | Laboratory-IV | Professional Electives-I Lab. | 0 | 0 | 2 | 1 |
| 5 | CS505G | Laboratory-V | Seminar | 0 | 0 | 2 | 2 |
| **Total Credits (Theory + Sessional)** | | | | | | | 22 |

**List of Electives 5$^{th}$Semester CSE**

**Professional Elective-I**

| Course No. | Subject Name |
|---|---|
| **ITP501** | Web Technology |
| **CSP504** | Linux Programming |
| **CSP505** | System Analysis and Design |
| **ITP502** | Semantics Web |

| **Open Elective-I** | |
|---|---|
| **Course No.** | Subject Name |
| **CSO506** | Data Science* |
| **CSO507** | Computer Architecture* |
| **ITO501** | Data Base Management Systems* |
| **ITO502** | Data Communication |

*These subjects are open for all the branches other than CSE and IT.

**6th Semester, CSE**

| S. No | Course Code | Category | Subject | L | T | P | Credit |
|---|---|---|---|---|---|---|---|
| 1 | CSC601 | Professional Core-I | Computer Networks | 3 | 1 | 0 | 4 |
| 2 | CSC602 | Professional Core-II | Data Science | 2 | 1 | 0 | 3 |
| 3 | CSC603 | Professional Core-III | Image Processing | 2 | 1 | 0 | 3 |
| 4 | | Professional Electives-II | List of Professional Electives-II | 2 | 1 | 0 | 3 |
| 5 | | Open Elective-II | List of Open Elective-II | 2 | 1 | 0 | 3 |
| **Laboratory/Sessional** | | | | | | | |
| 1 | CS601P | Laboratory-I | Computer Networks Lab. | 0 | 0 | 2 | 1 |
| 2 | CS602P | Laboratory-II | Data Science Lab. | 0 | 0 | 2 | 1 |
| 3 | CS603P | Laboratory-III | Image Processing Lab. | 0 | 0 | 2 | 1 |
| 4 | CS604P | Laboratory-IV | Professional Electives-II Lab. | 0 | 0 | 2 | 1 |
| 5 | CS605I | Laboratory-V | Internship/Tour & Training /Industrial Training | 0 | 0 | 2 | 2 |
| **Total Credits (Theory + Sessional)** | | | | | | | 22 |

List of Electives 6th Semester, CSE

| **Professional Elective-II** | |
|---|---|
| **Course No.** | Subject Name |
| **CSP604** | Soft Computing |
| **CSP605** | System Software |
| **CSP606** | Distributed System |
| **CSP607** | Natural Language Processing |
| **CSP608** | Software Engineering |

| **Open Elective-II** | |
|---|---|
| **Course No.** | Subject Name |
| **ITO601** | Information Retrieval |
| **CSO609** | AI and Machine Learning* |
| **CSO610** | Computer Network* |
| **ITO602** | Internet Of Things (IOT) |

*These subjects are open for all the branches other than CSE and IT.

## Course Structure for 5th and 6th Semester IT

### 5th Semester, IT

| Sl. No | Course Code | Category | Subject | L | T | P | Credit |
|---|---|---|---|---|---|---|---|
| 1 | CSC501 | Professional Core-I | Computer Organization and Architecture | 3 | 1 | 0 | 4 |
| 2 | ITC501 | Professional Core-II | Information System | 2 | 1 | 0 | 3 |
| 3 | CSC503 | Professional Core-III | Computer Graphics | 2 | 1 | 0 | 3 |
| 4 | | Professional Electives-I | List of Professional Electives-I | 2 | 1 | 0 | 3 |
| 5 | | Open Elective-1 | List of Open Elective-1 | 2 | 1 | 0 | 3 |
| **Laboratory/Sessional** | | | | | | | |
| 1 | CS501P | Laboratory-I | Computer Organization and Architecture Lab. | 0 | 0 | 2 | 1 |
| 2 | IT501P | Laboratory-II | Information System Lab. | 0 | 0 | 2 | 1 |
| 3 | CS503P | Laboratory-III | Computer Graphics Lab. | 0 | 0 | 2 | 1 |
| 4 | CS504P | Laboratory-IV | Professional Electives-I Lab. | 0 | 0 | 2 | 1 |
| 5 | IT505G | Laboratory-V | General Proficiency / Seminar | 0 | 0 | 2 | 2 |
| **Total Credits (Theory + Sessional)** | | | | | | | 22 |

### 5th Semester, electives list IT

**Professional Elective-I**

| Course No. | Subject Name |
|---|---|
| ITP501 | Web Technology |
| CSP504 | Linux Programming |
| CSP506 | Compiler Design |
| ITP502 | Semantics Web |

**Open Elective-I**

| Course No. | Subject Name |
|---|---|
| CSO506 | Data Science* |
| CSO507 | Computer Architecture* |
| ITO501 | Data Base Management Systems* |
| ITO502 | Data Communication |

*These subjects are open for all the branches other than CSE and IT.

**6th Semester, IT**

| S. No | Course Code | Category | Subject | L | T | P | Credit |
|---|---|---|---|---|---|---|---|
| 1 | CSC601 | Professional Core-I | Computer Networks | 3 | 1 | 0 | 4 |
| 2 | CSC602 | Professional Core-II | Data Science | 2 | 1 | 0 | 3 |
| 3 | CSC603 | Professional Core-III | Image Processing | 2 | 1 | 0 | 3 |
| 4 | | Professional Electives-II | List of Professional Electives-II | 2 | 1 | 0 | 3 |
| 5 | | Open Elective-II | List of Open Elective-II | 2 | 1 | 0 | 3 |
| **Laboratory/Sessional** | | | | | | | |
| 1 | CS601P | Laboratory-I | Computer Networks Lab. | 0 | 0 | 2 | 1 |
| 2 | CS602P | Laboratory-II | Data Science Lab. | 0 | 0 | 2 | 1 |
| 3 | CS603P | Laboratory-III | Image Processing Lab. | 0 | 0 | 2 | 1 |
| 4 | CS604P | Laboratory-IV | Professional Electives-II Lab. | 0 | 0 | 2 | 1 |
| 5 | IT605I | Laboratory-V | Internship/Tour & Training /Industrial Training | 0 | 0 | 2 | 2 |
| **Total Credits (Theory + Sessional)** | | | | | | | 22 |

## Syllabus for B. Tech course in Computer Science & Engineering and Information Technology

**6th Semester, elective list IT**

| **Professional Elective-II** | |
|---|---|
| **Course No.** | Subject Name |
| **CSP604** | Soft Computing |
| **CSP605** | System Software |
| **CSP606** | Distributed System |
| **CSP607** | Natural Language Processing |
| **CSP608** | Software Engineering |
| **Open Elective-II** | |
| **Course No.** | Subject Name |
| **ITO601** | Information Retrieval |
| **CSO609** | AI and Machine Learning* |
| **CSO610** | Computer Network* |
| **ITO602** | Internet Of Things (IOT) |

*These subjects are open for all the branches other than CSE and IT.

**Detailed Syllabus**

| **Computer Science & Engineering and Information Technology** | | | | | |
|---|---|---|---|---|---|
| **Code: CSC501** | **Computer Organization and Architecture** | **L** | **T** | **P** | **C** |
| | | **3** | **1** | **0** | **4** |

**This course open to all branch except CSE/IT.**

**Course Outcomes:**

1. Ability to describe the organization of computer and machine instructions and programs
2. Ability to analyze Input / Output Organization
3. Analyze the working of the memory system and basic processing unit.
4. Ability to solve problems of multi cores, multiprocessors and clusters.
5. Choose optical storage media suitable for multimedia applications.

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 3 | - | 2 | 2 | - | - | - | - | - | - | 1 |
| **CO2** | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 |
| **CO3** | 2 | 2 | 2 | 2 | 3 | - | - | - | - | - | - | 2 |
| **CO4** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | 2 |
| **Average** | | | | | | | | | | | | |

**3: high, 2: moderate, 1 low*

**MODULE-I:**

**Basics of Digital Electronics:** Multiplexers and De multiplexers, Decoder andEncoder, Codes, Logic gates, Flip flops, Registers.
**Register Transfer and Micro Operations:** Bus and Memory Transfer, Logic Micro Operations, Shift Micro Operations, Register transfer and register transfer language, Design of arithmetic logic unit.

**MODULE II:**

**Basic Computer Organization:** Instruction codes, Computer instructions, Timing and Cont rol, Instruction cycle, Memory reference Instruction, Complete computer description, Design of basic computer, Input output and interrupt.

**MODULE III:**

**Control Unit:** Hardwired controls, Micro programmed controls.
**Central Processing Unit** : Program control, Reduced instruction set computer, Complex instruction set computer, Data Transfer, Manipulation, General register and stack organization, Addressing mode.

**MODULE IV:**

**Computer Arithmetic:** Addition and subtraction algorithm, Multiplication algorithm, Division algorithms.

**MODULE V:**

**Input-Output Organization:** Priority interrupt, Peripheral devices, Input output interface, Data transfer schemes, Program control and interrupts, Direct memory access transfer, Input/output processor.
**Memory Unit:** High speed memories, Memory hierarchy, Processor Vs Memory speed, Cache memory, Associative memory, Inter leave, Virtual memory, Memory management.

**MODULE VI :**

**Introduction to Parallel Processing:** Pipelining, Characteristics of multiprocessors, Interconnection structures, Inter processor arbitration, Inter processor communication, Synchronization.

**Text Books:**

1. Computer System Architecture by Morris Mano, Prentice hall, 3rd Edition, (2007)

**References:**

1. Computer Organization by Carl Hamacher, ZvonkoVranesic, SafwatZaky, Tata Mcgraw Hill, 5th Edition, (2011)

2. Computer Architecture : A Quantitative Approach by Hennessy, J. L, David A Patterson, and Goldberg, Pearson Education, 4th Edition, (2006)

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSC502** | **Compiler Design** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Pre-requisites:** knowledge of automata theory, context free languages, computer architecture, data structures and simple graph algorithms, logic or algebra.

**MODULE-I:**

**Introduction to compiler and Finite automata**

Compilers, Analysis of source programs, Tokens, patterns, lexemes, Phases of compilers, Parsing, Parse trees, Ambiguity, Associativity and precedence of operators, Top-down parsing, Bottom-up parsing, Left recursion, Syntax directed translation. Classification of grammars, NFA, DFA, Conversion of NFA to DFA, RE to NFA (Thompson's Construction), Optimization of NFA/DFA using FIRSTPOS, LASTPOS, FOLLOWPOS.

**MODULE-II:**

**Context Free Grammar**

RE vs. CFG, Eliminating ambiguity and left recursion, Left factoring.

**MODULE-III:**

**Compiler Parser**

Top down parsing-LL parser, LL grammars. Bottom up parsing- LR parser, SLR parser, CLR parser, LALR parser. Polishing expressions Operator precedence grammar. LR grammars. Comparison of parsing methods. Error handling.

**MODULE-IV:**

**Run time environments**

Symbol tables, Language facilities for dynamic storage allocation, Dynamic storage allocation technique, Organization for non-block and block structured languages.

**MODULE-V:**

**Intermediate code generation**

Intermediate languages, graphical representations, Synthesized and inherited attributes, Dependency graph, Syntax directed translation, S and L- attributed definitions, Polish notation, Three address, quadruples, triples, indirect triples Flow of control statement.

**MODULE-VI:**

**Code optimization and code generation**

Basic blocks and flow graphs, Optimization of basic blocks, Code optimization techniques, Issues in design of code generator, Target machine code and simple code generator.

**Suggested Text Books**

- Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Monica S. Lam, *Compilers: Principles, Techniques, and Tools*. Addison-Wesley, 2006 (optional).
- Thomas W. Parsons, *Introduction to Compiler Construction*. Computer Science Press,**1992.**

**Suggested Reference books**

- Compiler design in C, A.C. Holub, PHI.
- Compiler construction (Theory and Practice), A.Barret William and R.M. Bates, Galgotia Publication.
- Compiler Design, Kakde.
-

**COURSE OUTCOMES**

| | |
|---|---|
| **1** | *Identify* the issue that arises in the design and construction of translator for programming language. |
| **2** | *Analyze* RE and CFG to specify the lexical and syntactic structure of programming language. |
| **3** | *Design* different parsers from given specification. |
| **4** | *Assess* the various program transformations. |
| **5** | *Design* a compiler for a programming language. |

**CO-PO MAPPING**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | - | 3 | 2 | 2 | - | - | - | - | - | 1 | - | - |
| **2** | - | 3 | - | 2 | - | - | - | - | - | - | - | - |
| **3** | - | - | 2 | 2 | - | - | - | - | - | 2 | - | - |
| **4** | - | 2 | - | 2 | - | - | - | - | - | - | - | - |
| **5** | - | - | 2 | 1 | - | - | - | - | - | 1 | - | - |

**3: high, 2: moderate, 1: low*

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSC503** | **Computer Graphics** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Objectives of the course:**

This course covers basics of computer graphics. Computer graphics are pictures and films created using computers. Usually, the term refers to computer-generated image data created with the help of specialized graphical hardware and software. It is a vast and recently developed area of computer science. Computer graphics is responsible for displaying art and image data effectively and meaningfully to the consumer. It is also used for processing image data received from the physical world. Computer graphics development has had a significant impact on many types of media and has revolutionized animation , movies, advertising, video games, and graphic design in general.

**Course Outcomes**

After completing this course, the student will be able to:

| | |
|---|---|
| **CO1** | Understand the basics of computer graphics, different graphics systems and applications of computer graphics. |
| **CO2** | Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis. |
| **CO3** | Use of geometric transformations on graphics objects and their application in composite form. |
| **CO4** | Extract scene with different clipping methods and its transformation to graphics display device. |
| **CO5** | Render projected objects to naturalize the scene in 2D view and use of illumination models for this |

**Module – I:**
Introduction to computer graphics and graphics systems. Raster and vector graphics systems, video display devices, physical and logical input devices, simple color models.

**Module – II:**
Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Ci rcle generation algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

**Module – III:**

2D Transformation : Basic transformations : translation, rotation, scaling ; Matrix representations & homogeneous coordinates, transformations between coordinate systems ; reflection shear ; Transformation of points, lines, parallel lines, intersecting lines.

**Module – IV:**
Viewing pipeline, Window to Viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

**Module – V:**
Hidden Surfaces: Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry. Rendering of a polygonal surface; Flat, Gouraud, and Phong shading; Texture mapping, bump texture, environment map; Introduction to ray tracing; Image synthesis, sampling techniques, and anti-aliasing.

**Text Books**

1. Donald Hearn and Pauline Baker Computer Graphics, Prentice Hall, New Delhi, 2012

2. Steven Harrington, "Computer Graphics- A programming approach", McGraw 3. Hill, 2nd Edition, 1987.

**Reference Book**

3. Foley J.D., Van Dam A, "Fundamentals of Interactive Computer Graphics", Addison Wesley, 1990

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: ITP501** | **Web Technology** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Course Objective:** The focus in this course is on the World Wide Web continues to provide a foundation for the developmentofabroadrangeofincreasinglyinfluentialandstrategictechnologies,supporting a large variety of applications and services, both in the private and public s ectors. There is a growing need for management and decision makers to gain a clearer understanding of the application development process, from planning through to deployment and maintenance. In this course, you will learn about the HTTP communication protocol, the markup languages HTML, XHTML and XML, the CSS standards for formatting and transforming web content, interactive graphics, multimedia content on the web, client -side programming using Javascript; an understanding of approaches to more dynamic and mobile content; and demonstrate how you can analyze requirements, plan, design, implement and test arrange of webapplications.

**Course Prerequisite**

- Programming for Problemsolving.
- Object Oriented Programming ThroughJava.
- Basic concept ofNetworking.

**Course Outcomes**

After Successful completion of course, the students will be able to

| CO | Description |
|---|---|
| **CO 1** | **Describe** various web technology and application development issues and trends. |
| **CO 2** | **Design** static and dynamic web pages using HTML, CSS and Java Script. |
| **CO 3** | **Design** and implement web services from the server and client side. |
| **CO 4** | **Build** interactive Web applications using JSP and Servlet. |
| **CO 5** | **Identify** the engineering structural design of XML and parse construction tree model. |

**CO-PO Mapping:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | P10 | P11 | P12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | - | 3 | - | - | - | - | - | - | - | 2 | - | - |
| **CO 2** | 3 | 2 | 3 | 2 | 3 | 1 | - | - | - | - | - | - |
| **CO 3** | - | - | 3 | - | 2 | | - | - | 2 | - | - | - |
| **CO 4** | 2 | 2 | 3 | - | 2 | 1 | - | - | - | - | - | - |
| **CO 5** | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| **Avg** | 2.33 | 2.25 | 3 | 2 | 2.33 | 1 | | | 2 | 2 | | |

**Note**- *3: high, 2: moderate, 1 low*

**Module – I**

Introduction to html: Fundamentals of HTML elements, Document body, Different tags, sections, text, hyperlink, lists, tables, color and images, frames, frameset, form.

Web Pages: types and issues, tiers; comparisons of Microsoft and java technologies; WWW: Basic concept, web client and web server, HTTP protocol (frame format), universal resource locator (URL).

**Module – II**

Dynamic web pages: The need of dynamic web pages; an overview of DHTML, Cascading Style Sheets (CSS), comparative studies of different technologies of dynamic page creation.
Active web pages: Need of active web pages; java applet life cycle.

**Module – III**

JavaScript: Data types, variables, operators, conditional statements, array object, date object, string object.

Java Servlet: Servlet environment and role, HTML support, Servlet API, the Servlet Life cycle, cookies and sessions.

**Module – IV**

JSP: JSP architecture, JSP servers, JSP tags, understanding the layout in JSP, Declaring Variables, methods in JSP, inserting java expressions in JSP, processing request from user and generating dynamic response for the user, inserting applets and java beans into JSP, using include and forward action, comparing JSP and CGI program, comparing JSP and ASP program; Creating ODBC data source name, introduction to JDBC, prepare statement and callable statement.

**Module – V**

J2EE:AnoverviewofJ2EEwebservices,basicsofEnterpriseJavaBeans,EJBvs.JavaBeans,basic of RMI,JNI.

XML: Basics XML, elements and attributes, document type definition, xml parsers, sequential and tree approach

**Text Books:**

1. ChrisBates,"WebProgramming:BuildingInternetApplications",WileyDreamTech, 2nd Edition,2002.
2. Jeffrey C K Jackson, Web Technologies", Pearson Education, 1stEdition,2006.
3. JasonHunter,WilliamCrawford—JavaServletProgrammingO'Reilly Publications, 2nd Edition, 2001.

**References**

1. W Hans Bergsten, "Java Server Pages", O'Reilly, 3rd Edition,2003.
2. D. Flanagan, "Java Script", O'Reilly, 6th Edition,2011.
3. Jon Duckett, "Beginning Web Programming", WROX, 2nd Edition,2008.
4. Herbert Schildt, "Java the Complete Reference", Hill - Osborne, 8th Edition,2011.

**List of Open Source Software/learning website:**

- Browsers like IE, Mozilla, Firefoxetc.
- Server softwareXAMPP/WAMP/LAMP.
- www.apachefriends.org
- www.w3.org
- www.w3schools.com
- www.php.net
- www.mysql.com
- www.phpmyadmin.net
- www.javatpoint.com

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSP504** | **Linux Programming** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **0** |

**Course objectives:**

CO1: able to understand the basic commands of Linux operating system and can write shell scripts.

CO2: able to create file systems and directories and operate them

CO3: Students will be able to create processes background and fore ground etc. by fork() system calls

CO4: able to create shared memory segments, pipes, message queues and can exercise inter process communication

**CO PO Mapping**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | - | - | - | | - | - | - | - | - |
| **CO2** | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 3 | 3 | 1 | - | - | - | - | - | - | - | - |

**Module -I: Linux Utilities:**

File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities, Backup utilities;

Shell programming with Bourne Again Shell (bash): Introduction, Shell responsibilities, Pi pes and redirection, here documents, Running a shell script, Shell as a programming language, Shell meta characters, File -name substitution, Shell variables, Command substitution, Shell commands, The environment, Quoting, test command, Control structures, Arithmetic in shell, Shell script examples, Interrupt processing functions, Debugging shell scripts.

**Module-II: Files and Directories:**

File concepts, File types File system structure, file metadata - Inodes, kernel support for files, System calls for the file I/O operations - open,create,read,wrirte,close,lseek,dup2,file status information -stat family, file and record locking-fcntl function, file permissions - chmod, fchmod, file ownership - chown, lchown, fchown, links-soft links and hard links - symlink, link, unlink.

Directories: Creating, removing and changing Directories - mkdir, rmdir, chdir, obtaining current working directory- getcwd, directory contents, scanning directories - opendir, readdir, rewin functions.

**Module- III:**

Process: Process concept, Layout of a C program image in main memory, Process environment – environment list, environment variables, getenv, setenv, Kernel support for process, Process identification, Process control - Process creation, replacing a process image, waiting for process, Process termination, Zombie process, Orphan process, ,system call interface for process management – fork, vfork, exit, wait, waitpid, exec family, process groups, sessions and controlling Terminal, differences between threads and processes.

Signals: Introduction to signals, Signal generation, Signal handling, Kernel support for signals, signal function, Unreliable signals, Reliable signals, Signal functions: kill, raise, alarm, pause, abort, sleep.

**Module- IV:**

Inter process Communication: Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, Pipes-creation IPC between related processes using FIFOs (Named pipes), differences between unnamed and named pipes, popen and pclose library functions.

Message Queues: Kernel support for messages, APIs for message queues, Client/Server example

Semaphores: Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

**Module-V:**

Shared Memory: Kernel support for Shared Memory, APIs for Shared Memory, Shared Memory example.

Sockets: Introduction to Berkley Sockets, IPC over a network, client – server model, Socket address structures (Unix domain and internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example- client/server programs- single server- client connection, multiple simultaneous clients, socket options- setsockopt and fcntl system calls, comparison of IPC mechanisms.

**TEXT BOOKS:-**

1. Unix System Programming using C++, T. Chan, PHI.
2. Unix concepts and Applications, 4th Edition, Sumitabha Das, TMH.
3. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Willey India Edition.

**REFERRENCE BOOKS:**

1. Linux System Programming. Robert Love, O'Reilly, SPD.
2. Advanced Programming in the Unix environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. Unix Network Programming, W.R.Steven, PHI.
4. UNIX for Programming and users, 3rd Edition, Graham Glass, King Ables, Pearson Edition.
5. UNIX and shell Programming, B.A.Forouzan and R.F.Koretsky, S.A.Sarawar, Pearson edition.
6. Unix The Text book, 2nd edition, S.M.Sarawar, Koretsky, S.A.Sarawar, Pearson Edition

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSP505** | **System Analysis and Design** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**COURSE OUTCOMES:**

| | |
|---|---|
| **CO 1** | Identify the issue that arises in the design of systems as a whole |
| **CO 2** | Ability to understand the Software Development Life Cycle |
| **CO 3** | Students will be able to understand different types of system designing and Modelling |
| **CO 4** | Students will be able to understand Maintenance, Testing and structured Design |
| **CO 5** | Ability to understand the Security and Threats |

**CO-PO MAPPING:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | - | 3 | 2 | 2 | - | - | 2 | - | - | 1 | - | - |
| **CO 2** | - | 3 | - | 2 | - | - | - | - | - | - | - | - |
| **CO 3** | - | - | 2 | 2 | - | 3 | - | - | - | 2 | - | - |
| **CO 4** | - | 2 | - | 2 | - | - | - | - | - | - | - | - |
| **CO 5** | - | - | 2 | 1 | - | - | - | - | - | 1 | - | - |

**3: high, 2: moderate, 1: low*

**MODULE- I:**

**INTRODUCTION**

**System definition and concepts:** Characteristics and types of system, Manual and automated systems

**Real-life Business sub-systems:** Production, Marketing, Personal, Material, Finance

**Systems models types of models: Systems** environment and boundaries, Real-time and distributed systems, Basic principles of successful systems

**MODULE- II:**

**SYSTEMS ANALYST**

Role and need of systems analyst, Qualifications and responsibilities, Systems Analyst as and agent of change,

**Introduction to systems development life cycle (SDLC):**

**Various phases of development: Analysis** , Design, Development, Implementation, Maintenance

**Systems documentation considerations:** Principles of systems documentation, Typesof documentation and their importance, enforcing documentation discipline in anorganization.

**System Planning**

Data and fact gathering techniques: Interviews, Group communication, Presentations, Sitevisits. Feasibility study and its importance, Types of feasibility reports System Selection plan and proposal Prototyping

**Cost-Benefit and analysis:** Tools and techniques

**MODULE- III:**

**SYSTEMS DESIGN AND MODELING**

Process modeling, Logical and physical design, Design representation, Systems flowcharts and structured charts, Data flow diagrams, Common diagramming conventions and guidelines using DFD and ER diagrams. Data Modeling and systems analysis, designing the internals: Program and Process design, Designing Distributed Systems.

**Input and Output Classification of forms:** Input/output forms design, User-interface design, Graphical interfaces

**MODULE- IV:**

**MODULAR AND STRUCTURED DESIGN**

Module specifications, Module coupling and cohesion, Top-down and bottom-up design

**System Implementation and Maintenance**

Planning considerations, Conversion methods, producers and controls, System acceptance Criteria, System evaluation and performance, Testing and validation, Systems quality Control and assurance, Maintenance activities and issues.

**MODULE- V:**

**SYSTEM AUDIT AND SECURITY**

**Computer system as an expensive resource:** Data and Strong media Procedures and norms for utilization of computer equipment, Audit of computer system usage,Audit trails

**Types of threats to computer system and control measures:** Threat to computer system and control measures, Disaster recovery and contingency planning

**Object Oriented Analysis and design**

Introduction to Object Oriented Analysis and design life cycle, object modeling: Class Diagrams, Dynamic modeling: state diagram, Dynamic modeling: sequence diagramming.

**TEXT BOOKS: -**

1. System Analysis and Design Methods, Whitten, Bentaly and Barlow, Galgotia Publication.

2. System Analysis and Design Elias M. Award, Galgotia Publication

**REFERENCES**

3. Modern System Analysis and Design, Jeffrey A. Hofer Joey F. George JosephS. Valacich Addison Weseley.

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: ITP502** | **Semantics Web** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**COURSE OUTCOMES:**

| | |
|---|---|
| **CO1** | *Understand* and *explain* the overall architecture of semantic web and to illustrate the overview of design principles and technologies in semantic web. |
| **CO2** | *Design and implement* a small ontology that is semantically descriptive of your chosen problem domain, implement applications that can access, use and manipulate the ontology, represent data from a chosen problem in XML with appropriate semantic tags obtained or derived from the ontology. |
| **CO3** | *Describe* the semantic relationships among these data elements using Resource Description Framework (RDF). |
| **CO4** | *Design and implement* a web services application that —discovers‖ the data and/or other web services via the semantic web (which includes the RDF, data elements in properly tagged XML, and the ontology), discover the capabilities and limitations of semantic web technology for different applications. |

**CO-PO MAPPING:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | - | 3 | 3 | 2 | - | - | - | - | - | - | 2 | - |
| **CO3** | 3 | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | - | 3 | 3 | 2 | - | - | - | - | - | - | 2 | - |
| **Avg.** | 1.5 | 1.5 | 1.5 | 1 | - | - | - | - | - | - | 1 | - |

**3: high, 2: moderate, 1 low*

**DETAIL SYLLABUS:**

**MODULE-I:**

**INTRODUCTION**

Introduction to the Syntactic Web and Semantic Web – Evolution of the Web – the Visual and Syntactic Web – Levels of Semantics – Metadata for Web Information – theSemantic Web Architecture and Technologies – Contrasting Semantic with Conventional Technologi es– Semantic Modelling -Potential of Semantic Web Solutions and Challenges of AdoptionDesign Principles.

**MODULE-II:**

**KNOWLEDGE REPRESENTATION AND ONTOLOGIES**

Knowledge Representation and Reasoning - Ontologies- Taxonomies –Topic Maps – Classifying Ontologies - Terminological Aspects: Concepts, Terms, Relations Between Them – Complex Objects -Subclasses and Sub-properties definitions –Upper Ontologies – Quality – Uses - Types of Terminological Resources for Ontology Building – Methods and Methodologies for Building Ontologies – Multilingual Ontologies -Ontology Development Process and Life Cycle – Methods for Ontology Learning – Ontology Evolution – VersioningOntologies in Semantic Web.

**MODULE-3:**

**STRUCTURING AND DESCRIBING WEB RESOURCES**

Structured Web Documents - XML – Structuring – Namespaces – Addressing – Querying – Processing - RDF – RDF Data Model – Serialization Formats- RDF Vocabulary –InferencingRDFS – basic Idea – Classes – Properties- Utility Properties – RDFS Modelling forCombinations and Patterns- Transitivity.

**MODULE-4:**

**WEB ONTOLOGY LANGUAGE**

OWL – Sub-Languages – Basic Notions -Classes- Defining and Using Properties – Domain and Range – Describing Properties - Data Types – Counting and Sets- Negative Property Assertions – Advanced Class Description – Equivalence – OWL Logic.

**MODULE-5:**

**SEMANTIC WEB TOOLS AND APPLICATIONS**

State - of- the- Art in Semantic Web Community-Development Tools for Semantic Web – Jena Framework – SPARL –Querying Semantic Web- Semantic Desktop – Semantic Wikis - Semantic Web Services – Application in Science – Business

**TEXTBOOKS:**

1. LiyangYu,‖A Developer‘s Guide to the Semantic Web‖, Springer, First Edition, 2011.

2. John Hebeler, Matthew Fisher, Ryan Blace and Andrew Perez-opez, —Semantic Web Programming‖, First Edition, Wiley, 2009.

3. Grigoris Antoniou, Frank van Harmelen, —A Semantic Web Primer‖, Second Edition, MIT Press, 2008. 4. Robert M.Colomb,‖Ontology and the Semantic Web‖, Frontiers in Artificial Intelligence and Applications, IOS Press, 2007.

5. Dean AllemangandJamesHendler,‖Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL‖, Second Edition, Morgan Kaufmann, 2011.

6. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, —Foundations of Semantic Web Technologies, CRC Press, 2009.

**REFERENCES:**

1. Michael C. Daconta, Leo J.Obrst and Kevin T. Smith, —The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management‖, First Edition, Wiley, 2003

2. Karin Breitman, MarcoAntonio Casanova and Walt Truszkowski, —Semantic Web: Concepts,TechnologiesandApplications(NASAMonographsinSystemsandSoftware Engineering) Springer, 2010.

3. VipulKashyap,ChristophBusslerandMatthew Moran, The Semantic Web: Semantics forDataandServicesontheWeb(Data-CentricSystemsand Applications),Springer,2008.

| Computer Science & Engineering | | | | | |
|---|---|---|---|---|---|
| **Code: CSO507** | **Computer Architecture*** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

***This course open to all branch except CSE/IT.**

**Course Outcomes:**

1. Ability to describe the organization of computer and machine instructions and programs
2. Ability to analyze Input / Output Organization
3. Analyze the working of the memory system and basic processing unit.
4. Ability to solve problems of multicores, multiprocessors and clusters.
5. Choose optical storage media suitable for multimedia applicat ions.

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 3 | - | 2 | 2 | - | - | - | - | - | - | 1 |
| **CO2** | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 |
| **CO3** | 2 | 2 | 2 | 2 | 3 | - | - | - | - | - | - | 2 |
| **CO4** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | 2 |
| **Average** | | | | | | | | | | | | |

**3: high, 2: moderate, 1 low*

**MODULE-I:**

**Basics of Digital Electronics:** Multiplexers and De multiplexers, Decoder andEncoder, Codes, Logic gates, Flip flops, Registers.

**Register Transfer and Micro Operations:** Bus and Memory Transfer, Logic Micro Operations, Shift Micro Operations, Register transfer and register transfer language, Design of arithmetic logic unit.

**MODULE-II:**

**Basic Computer Organization:** Instruction codes, Computer instructions, Timing and Cont rol, Instruction cycle, Memory reference Instruction, Complete computer description, Design of basic computer, Input output and interrupt.

**MODULE-III:**

**Control Unit:** Hardwired controls, Micro programmed controls.

**Central Processing Unit** : Program control, Reduced instruction set computer, Complex instruction set computer, Data Transfer, Manipulation, General register and stack organization, Addressing mode.

**MODULE-IV:**

**Computer Arithmetic:** Addition and subtraction algorithm, Multiplication algorithm, Division algorithms.

**MODULE-V:**

**Input-Output Organization:** Priority interrupt, Peripheral devices, Input output interface, Data transfer schemes, Program control and interrupts, Direct memory access transfer, Input/output processor.

**Memory Unit:** High speed memories, Memory hierarchy, Processor Vs Memory speed, Cache memory, Associative memory, Inter leave, Virtual memory, Memory management.

**MODULE-VI:**

**Introduction to Parallel Processing:** Pipelining, Characteristics of multiprocessors, Interconnection structures, Inter processor arbitration, Inter processor communication, Synchronization.

**Text Books:**

1. Computer System Architecture by Morris Mano, Prentice hall, 3rd Edition, (2007)

**References:**

1. Computer Organization by Carl Hamacher, ZvonkoVranesic, SafwatZaky, Tata Mcgraw Hill, 5th Edition, (2011)
2. Computer Architecture : A Quantitative Approach by Hennessy, J. L, David A Patterson, and Goldberg, Pearson Education, 4th Edition, (2006)

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: ITC501** | **Information System** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Course Outcomes**

CO1: Define fundamental concepts of the information system.

CO2: Relate the basic concepts and technologies used in the field of information systems.

CO3: Understand various applications of IS in business environment and management.

CO4: Able todesign and develop information systems.

CO5: Apply and analyze the different security challengesand ethical measures

**CO PO mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 1 | - | - | - | - | | - | - | - | - | - |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 2 | - | **1** | - | - | - | - | - | - | - | -- |

**Module 1–Introduction to Information systems**

Information system, Fundamental roles of IS in business, Trends in information systems, The roles of IS in business, Types of Information systems; Components of Information Systems, Information system resources, information system activities, recognizing information systems; Fundamentals of strategic advantage, Using information technology for strategic advantage.

**Module 2: Information Technology**

Computer hardware; Computer software: Application software and System software; Data resource management: database management, database structures, data warehouse and data mining; Telecommunication and networks: Networkingthe enterprise, Telecommunication network alternatives; types of telecommunication networks.

**Module 3: Business Applications**

Enterprise business systems, Enterprise Resource Management, Customer relationship Management, Supply Chain Management, Benefits and challenges; E-Commerce systems, Decision support system, Executive information systems, knowledge management systems,Artificial intelligence technologies in business.

**Unit 4: Development Process**

System analysis and design, Systems development life cycle, Starting the systems development process, systems analysis, systems design, End User development, Implementation activities, implementation challenges.

**Unit 5: Management Challenges**

Business/IT security, ethics and society; ethical responsibility of business professionals, Privacy issues, computer crime, tools of security management, internetworked security defenses, security measures, System controls and audits; Managing information technology, Global IT management.

**Textbooks:**

1. O'Brien J. A. and Marakas G. M., Introduction to Information Systems, 14th Edition, McGraw-Hill Irwin, 2008.

**Reference:**

1. Kenneth C. Laudon, Jane Price Laudon, "Management Information Systems: Managing the digital firm", Pearson Education, PHI, Asia.
2. "Management Information Systems – The ManagersView", Tata McGraw Hill, 2008. Davis, Gorden B. Olson, M.H,
3. Jawadekar W S, "Management Information Systems", Second Edition, 2002, Tata.
4. "Modern Systems Analysis and Design" Jeffrey A.Hoffer, Joey F.George, Joseph S. Valachich, Prentice Hall

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: ITO502** | **Data Communication** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Module 1:** Signals and Signal Analysis: Periodic and nonperiodic signals, Composite signals, Signal analysis, Time and frequency domain representation. Introduction to Data and signal fundamentals, Analog and digital signals.

**Module 2:** Analog Transmission: Concepts of carrier signal, noise, modulating signal and modulated signal; Amplitude modulation – double sideband suppressed carrier, double sideband transmitted carrier, single sideband; Frequency modulation – Narrowband FM and wideband FM; Digital to analog conversion – Amplitude shift keying, Frequency shift keying, Phase shift keying, Quadrature amplitude modulation, Performance.

**Module 3:** Digital Transmission: Problems with digital transmission, Different line coding schemes, Block coding schemes, Scrambling techniques; Analog to digital conversion – Sampling techniques, Sampling theorem, Pulse amplitude modulation, Pulse code modulation, Differential pulse code modulation, Delta modulation (along with advantages and disadvantages of each technique), Transmission modes (serial and parallel).

**Module 4**: Multiplexing and Spreading: Concept of multiplexing, Frequency division multiplexing, Time division multiplexing – Synchronous and Statistical time division multiplexing.

**Module 5:** Introduction: Data Communications, Networks, Network Types, Internet History, Networks Models: Protocol Layering, TCP/IP Protocolsuite, The OSI model, Introduction to Physical Layer-1: Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance, Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding) .

Reference books:-

1. **"Data and Computer Communication" by William Stallings**

2. **"Data Communication and Networking" by Behrouz A Forouzan**

3. **"Computer Networks" by Andrew S Tanenbaum**

4. **"Communication Systems" by B P Lathi**

5. **"Communication Systems: Analog and Digital" by Sanjay Sharma**

| Computer Science & Engineering | | | | | |
|---|---|---|---|---|---|
| **Code: CS501P** | **Computer Organization and Architecture Lab** | **L** | **T** | **P** | **C** |
| | | **0** | **0** | **2** | **1** |

**List of Experiments:**

1. To design Half adder and Full adder circuit using Multi -Sim and verify the truth table.
2. To design Half sub-tractor and Full sub-tractor circuit using Multi-Sim and verify the truth table.
3. To construct and verify the operation of Parit y Bit Generator and Checker.
4. To construct and verify operation of 4x1, 8x1 Multiplexer.
5. To construct and verify the operation of 3x8 Decoder and 8x3 Encoder.
6. To design 2-bit arithmetic and logic unit and verify the truth table.
7. To design 4-bit universal shift register and verify the truth table.
8. To design the 4-bit ALU and verify the truth table.
9. To generate digital clock signal using 555 Timer.
10. To design 4-bit Binary Up Counter and verify the truth table.
    a. To study Cache Memory.
    b. To study Hardwired Control Unit&Micro-programmed Control Unit.

| Computer Science & Engineering | | | | | |
|---|---|---|---|---|---|
| **Code: CS502P** | **Compiler Design Lab** | **L** | **T** | **P** | **C** |
| | | **0** | **0** | **2** | **1** |

**Listof Experiments**

1. To Design a lexical analyzer for given language to recognize a few patterns in C (Ex. identifiers, constants, comments, operators etc.) and the lexical analyzer should ignore redundant spaces, tabs, and new lines.
2. To test whether a given identifier is valid or not.
3. To find out the FIRSTPOS and FOLLOWPOS for a given expression.
4. To implement LL (1) parser.
5. To implement Recursive Descent parser.
6. To implement a Symbol Table.
7. To identify that, for a given set of grammar, whether the string belongs to that grammar or not.

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CS503P** | **Computer Graphics Lab** | **L** | **T** | **P** | **C** |
| | | **0** | **0** | **2** | **1** |

**List of Experiments:**

1. To implement DDA Line Drawing Algorithm.
2. To implement Bresenham's Line Drawing Algorithm.
3. To implement Mid-Point Circle Drawing Algorithm.
4. To implement Mid-Point Ellipse Drawing Algorithm.
5. To implement 2-D Transformation.
6. To implement Boundary Fill Algorithm.
7. To implement Flood Fill Algorithm.
8. To implement Cohen Sutherland Line Clipping Algorithm.
9. To implement Sutherland Hodgeman Polygon Clipping Algorithm.

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CS504P** | **Linux Programming Lab** | **L** | **T** | **P** | **C** |
| | | **0** | **0** | **2** | **1** |

**List of experiments:**

1. Execute various Linux shell commands in bash shell and explore various options and arguments using man page.

2. Shell Script basics

   i. Write a *shell script* that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers
   ii. Write a *shell script* that deletes all lines containing a specified word in one or more files supplied as arguments to it
   iii. Write a *shell script* that displays a list of all files in the current directory to whi ch the user has read, write and execute permissions.
   iv. Write a *shell script* that receives any number of file names as its arguments, checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.

v. Write a *shell script* that receives any number of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
vi. Write a *shell script* to list all of the directory files in a directory.

3.
i. Write a *C program* that makes a copy of a file using standard I/O and system calls.
ii. Write a *C program* to emulate the Unix 'ls -l' command.
iii. Write client and server programs (*using C*) for interaction between server and client processes using Unix Domain sockets.
iv. Write a *C program* to list every file in a directory, its inode number and file name.
v. Implement in *C* the following Linux commands using system calls:
(a) cat (b) ls (c) mv

vi. Write a C program to emulate the UNIX ls –l command.
vii. Write a C program to list for every file in a directory, its inode number and file name.
viii. Write a C program that demonstrates redirection of standard output to a file.
Ex: ls > f1.

4. Write a C program to create a child process and allow the parent to display "parent" and the child to display "child" on the screen.
5. Write a C program to create a Zombie process and orphan process.
6. Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: – ls –l | sort
7. Write C programs that illustrate communication between two unrelated processes using named pipe
8. Write a C program to create a message queue with read and write permissions to write 3 messages to it with different priority numbers.
9. Write a C program to allow cooperating processes to lock a resource for exclusive use, using a) Semaphores b) flock or lockf system calls.
10. Write a C program that illustrates suspending and resuming processes using signals.
11. Write a C program that implements a producer-consumer system with two processes. (Using Semaphores ).
12. Write client and server programs (using c) for interaction between server and client processes using Unix Domain sockets.
13. Write client and server programs (using c) for interaction between server and client processes using Internet Domain sockets.
14. Write a C program that illustrates two processes communicating using shared memory.

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: IT501P** | **Information System Lab** | **L** | **T** | **P** | **C** |
| | | **0** | **0** | **2** | **1** |

**List of Experiments:**

1. Develop a student management system.

- It should contain all the information of University or a school.
- It should contain all the information of University Infrastructure or a school.
- It should contain all the information of University Students.

2. Design a marketing information system with fundamental inputs and outputs

Inputs: 1. Sales on units by each salesman for a period. 2. Estimated sales in units of competitor corresponding to above. 3. Economic conditions and trends.

Outputs: 1. Sales by product i.e. month wise and till date. 2. Sales by salesman i.e. month wise and till date. 3. Sales by trend analysis. 4. Sales forecasting

3. Given a fact table with sales data (for example sales (market#, product#, time#, amount) – see the lecture notes) and relevant dimension tables, write an SQL statement that slices the cube to select sales only in week 2, and dice it by regions.

4. To design a Personal Management Information System using XML to implement E -Commerce Marketing Strategies.

5. To identify top retail web sites and online sales volume of those websites and perform pattern analysis using data mining concepts.

6. To design an online learning database application with DBMS operations, working with tables, queries, forms, reports and data analysis.

7. To develop a transaction processing application to discover or identify similar patterns from transaction data using data mining techniques.

8. Case study 1

9. Case study 2

10. Mini Project

| Computer Science & Engineering | | | | | |
|---|---|---|---|---|---|
| **Code: IT502P** | **Web Technology Lab** | **L** | **T** | **P** | **C** |
| | | **0** | **0** | **2** | **1** |

**List of Experiments**

1. Design a web page using HTML which includes the following:

- To display your education details in a tabular format.
- To illustrate the usage of HTML Lists.
- To embed an image and create a link such that clicking on image takes user to other page.
- To embed an image map in a web page.
- To embed Audio and Video in a web page.

2.Design a static web page using HTML which includes the following:

- To create a frameset having header, navigation and content sections.
- To create frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.

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

4. Design a web page using CSS which includes the following:

- Use different font styles.
- Set background image for both the page and single elements on page.
- Control the repetition of image with background -repeat property
- Define style for links as a:link, a:active, a:hover, a:visited
- Add customized cursors for links.
- Work with layers.

5. Write a Java applet program:

- To display moving text or content.
- To draw lines, ovals, and rectangles.
- To display a Digital Clock.
- To select a URL from my Applet and send the browser to that page.

6.Write a JavaScript program:

- To design the scientific calculator and make event for each button.
- To compute the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.

7. Write JavaScript to validate the following fields of the above registration page:

- Name (Name should contains alphabets and the length should not be less than 6 characters).
- Password (Password should not be less than 6 characters length).
- E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com).
- Phone number (Phone number should contain 10 digits only).

8. Write a JavaBeans program to converts value of INR (Indian Rupees) into equivalent American/Canadian/Australian Dollar value.

9. Write a Java servlet programs to conduct online examination and to display student mark list available in a

Database.

10. Write an XML program:

- To display the Book information which includes the following:
- Title of the book
- Author Name
- ISBN number
- Publisher name
- Edition
- Price

**Semester – VI**

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSC601** | **Computer Networks** | **L** | **T** | **P** | **C** |
| | | **3** | **1** | **0** | **4** |

**Course Objective:**

This course includes learning about computer network organization and implementation. Students are introduced to computer network design and its operations, and discuss the topics of OSI communication model; error detection and recovery; LANs; network naming and addressing; and basics of cryptography and network security.

**Course Outcome:**

| | |
|---|---|
| **CO1** | Describe and analyze the importance of data communications and the layered protocol model |
| **CO2** | Describe, analyze and evaluate a number of data link, network, and transport layer protocols and network devices. |
| **CO3** | Have a basic knowledge of the use of cryptography and network security; |
| **CO4** | Explain concepts and theories of networking and apply them to various situations, classifying networks, analyzing performance and implementing new technologies |

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 1 | - | 2 | - | - | - | 1 | 1 | - | - | 2 |
| **CO2** | 2 | 2 | 1 | 1 | 3 | - | - | - | 1 | - | 1 | 2 |
| **CO3** | - | 1 | 3 | 2 | - | 2 | 2 | 3 | - | - | - | 3 |
| **CO4** | 3 | 2 | 2 | 2 | 2 | - | - | 2 | 1 | 1 | 2 | 2 |

**Course Description:**

**MODULE 1:**

Data communication Components**:** Representation of data and its flow in Networks, Various Connection Topology, Protocols and Standards, OSI model.Physical Layer: LAN technologies (Ethernet), Multiplexing, Transmission Media, Switching Techniques.

**MODULE 2:**

Data Link Layer: Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, and Sliding Window. Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA. Error Detection and Error Correction - Fundamentals, Block coding, CRC, Hamming Code.

**MODULE 3:**

Network Layer: Internetworking Devices. IP Addressing and Subnetting, Network Layer Protocols: IPV4, IPV6 and ICMP. Address Mapping: ARP, RARP and DHCP. Routing algorithms (link state and distance vector).

**MODULE 4:**

Transport Layer: Process to Process Delivery: UDP and TCP, Congestion Control and Quality of Services.

**MODULE 5:**

Application Layer: Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi.

**MODULE 6:**

Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.

**Text Books:**

1. "Data Communication and Networking", Behrouz Forouzan, McGraw Hill Education.

**Reference Books:**

1. "Computer Networks", Andrew S Tanenbaum, Pearson Edition
2. "Data and Computer Communications " , W. Stallings, PHI/ Pearson Education

| Computer Science & Engineering | | | | | |
|---|---|---|---|---|---|
| **Code: CSC602** | **Data Science** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Course Objective:**

The main objective of this course is to train the student to do theoretical with practical data science work, Career-wise, we expect our students to be able to develop into skilled data science researchers or software developers.

**Course Outcome:**

1. To enable students with data analytics skill
2. To develop knowledge of fundamentals of data science
3. To empower students with hands-on for data science
4. To make students experience with theoretical data science and programming

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO5** | **PO9** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|
| **CO1** | - | 3 | 2 | - | 1 | 3 | 3 |
| **CO2** | 3 | 2 | - | - | 2 | 2 | 2 |
| **CO3** | - | 2 | 3 | 3 | 3 | 3 | - |
| **CO4** | 2 | - | 2 | 3 | 3 | 2 | 2 |

**MODULE-I**

**INTRODUCTION: -**

Introduction to data science, Different sectors of using data science, Purpose and components of Python, Data Analytics processes, Exploratory data analytics, Quantitative technique and graphical technique, Data types for plotting.

**MODULE-II**

**STATISTICAL ANALYSIS: -**

Introduction to statistics, statistical and non-statistical analysis, major categories of statistics, population and sample, Measure of central tendency and dispersion, Moments, Skewness and kurtosis, Correlation and regression, Theoretical distributions – Binomial, Poisson, Normal

**MODULE-III**

**INTRODUCTION TO MACHINE LEARNING: -**

Machine learning, Types of learning, Properties of learning algorithms, Linear regression and regularization, model selection and evaluation, classification: SVM, kNN and decision tree, Ensemble methods: random forest, Naive Bayes and logistic regression, Clustering: k-means, feature engineering and selection, Dimensionality reduction: PCA

**MODULE-IV**

**PYTHON SETUP FOR MATHEMATICAL AND SCIENTIFIC COMPUTING: -**

Anaconda installation process, data types with python, basic operators and setup, introduction to numpy, mathematical functions of numpy, introduction to scipy, scipy packages, data frame and data operations, data visualisation using matplotlib

**Text Books**:

1. N.G.Das , Statistical Methods (combined edition Vol.I and Vol.II) – Mc Graw Hill
2. Roger D. Peng, Elizabeth Matusi, The Art of Data Science: A Guide for Anyone who work with data - Leanpub
3. AurelienGeron, Hands-On Machine Learning with Scikit – Learn &TensorFlow – O'reilly

**Reference Books:**

1. AndriyBurkov, The Hundred Page Machine Learning Book – Xpress Publishing
2. James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer.
3. Murphy, K. Machine Learning: A Probabilistic Perspective. - MIT Press
4. Jan Erik Solem, Programming Computer Vision with Python – O' Reilly

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSC603** | **Image Processing** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Pre-requisite(s)**

Knowledge ofData Structures, Computer Graphics required for this course.

**Objectives of the course**

**Course Outcomes:**

After completing this course, students will be able to:

| | |
|---|---|
| **CO1** | To study the image fundamentals and image transforms necessary for image processing |
| **CO2** | To study the image enhancement techniques. |
| **CO3** | To study the image restoration procedures and segmentation tools. |
| **CO4** | To study the wavelet tools and the image compression procedures. |

**Mapping of course outcomes with program outcomes:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | 2 | - | - | - | - | - | - | - | - | |
| **CO2** | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | - |
| **CO3** | 2 | - | 3 | 2 | - | - | - | - | - | - | - | - |
| **CO4** | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - |

**MODULE-I:**

**INTRODUCTION AND DIGITAL IMAGE FUNDAMENTALS**

Introduction: Origin, Steps in Digital Image Processing, Components. Digital Image Fundamentals: Elements of Visual Perception, Image Sampling and Quantization, Some Basic Relationships between pixels, Color Models.

**MODULE-II:**

**IMAGE TRANSFORM**

Introduction to the Fourier Transform, The Discrete Fourier Transform, Discrete Cosine Transform, Singular Value Decomposition and Principal Component Analysis.

**MODULE-III:**

**IMAGE ENHANCEMENT**

Spatial Domain: Some Simple Intensity Transformations, Histogram processing, Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filtering. Frequency Domain: Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

**MODULE-IV:**

**IMAGE RESTORATION AND SEGMENTATION**

Image Restoration: Noise models, Mean Filters, Order Statistics, Adaptive filters, Band reject Filters, Band pass Filters, Notch Filters, Optimum Notch Filtering, Inverse Filtering, Wiener filtering. Segmentation: Thresholding.

**MODULE-V:**

**WAVELETS AND IMAGE COMPRESSION**

Wavelets: Background, Sub-band Coding, Multi-resolution Expansions. Compression: Fundamentals, Image Compression Models, Error Free compression- Variable Length Coding, Bit-Plane Coding, Lossless Predictive Coding, Lossy Compression, Lossy Predictive Coding, Transform Coding and Wavelet Coding.

**TEXT BOOK:**

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.

**REFERENCES:**

1. S. Jayaraman, S Essakirajan, “Digital Image Processing”, Second Edition, Tata McGraw Hill, 2009
2. Khalid Sayood, “Introduction to Data Compression”, Third Edition, Elsevier, 2006.

3. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
4. https://cse19-iiith.vlabs.ac.in/index.html

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSP605** | **System Software** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Objectives of the course**

To introduce the student to key concepts in Phase transformations and enable an understanding of the steps involved in several important phase transformations.

**Course Outcomes**

After completing this course, the student should be able to:

| | |
|---|---|
| CO1 | Explain the organization of basic computer, its design and the design of control unit. |
| CO2 | Understand the organization of memory and memory management hardware. |
| CO3 | Distinguish between Operating Systems software and Application Systems software. |
| CO4 | Identify the primary functions of an Operating System. |
| CO5 | Master attributes and assessment of quality, reliability and security of software. |

Detailed Syllabus:

**MODULE-I**

INTRODUCTION: System Software, Application Software, components of a programming system: Assembler, Loader, Linker, Macros, Compiler, Program Development Cycle, Evolution of Operating Systems, Functions of Operating System, Machine Structure: General Machine Structure , Approach to a new machine, Memory Registers, Data, Instructions, Evolution of Machine Language: Long Way, No looping, Address Modification, Looping, Introduction to Assembly LanguageProgram.

**MODULE –II**

ASSEMBLERS: Review of Computer Architecture – Machine Instructions and Programs – Assemblers –Basic Assembler Functions – Assembler Features – Assembler Design Options. LOADERS AND LINKERS: Loaders and Linkers – Basic Loader Functions – Machine-Dependent Loader Features – Machine-Independent Loader Features– Loader Design Options-Dynamic Linking and Loading- Object files- Contents of an object file – designing an object format – Null object formats- Code sections- Relocation – Symbols and Relocation – Relocatable a.out-ELF.

**MODULE-III**

MACROPROCESSORS AND EMULATORS: Microprocessors – Basic Macro Processor Functions – Machine-Independent Macro Processor Features – Macro Processor Design Options - Introduction to Virtual Machines (VM) - Emulation - basic Interpretation – Threaded Interpretation – Interpreting a complex instruction set – binary translation.

**MODULE-IV**

VIRTUAL MACHINES: Pascal P-Code VM – Object-Oriented VMs – Java VM Architecture – Common Language Infrastructure – Dynamic Class Loading. ADVANCED FEATURES: Instruction Set Issues – Profiling – Migration – Grids – Code optimizations- Garbage Collection - Examples of real-world implementations of system software.

**TEXT BOOKS:**

1. Leland L. Beck, “System Software”, 3rd ed., PearsonEducation.
2. John R. Levine, “Linkers & Loaders”, MorganKauffman.
3. James E Smith and Ravi Nair, “Virtual Machines”,Elsevier.

**REFERENCES:**

1. Srimanta Pal, “ Systems Programming “ , Oxford UniversityPress.
2. John J.Donovan, “ “Systems Programming”, Tata McGraw-Hill.
3. Systems Programming by John J Donovan (McGraw-HillEducation)
4. Operating System and System Programming – Dhamdhere (McGraw-HillEducation)

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSP606** | **Distributed System** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Course objective:**

This course covers the basic understanding of distributed computing system. The course aims to provide an understanding of the principles on which the Internet and other distributed systems are based; their architecture, algorithms and how they meet the demands of contemporary distributed applications. The course covers the building blocks for a study of distributed systems, and addressing thecharacteristicsandthechallengesthatmustbeaddressedintheirdesign:scalability,heterogeneity, securityandfailurehandlingbeingthemostsignificant.Distributedcomputingisafieldof computerscience that studies distributed systems. A distributed syste m is a system whose components are located on different networked computers, which communicate and coordinate their actions bypassingmessagestooneanother.Thecomponentsinteractwithoneanotherinordertoachieve a common goal. Three significant characteristics of distributed systems are: concurrency of components, lack of a global clock, and independent failure ofcomponents.

**Course Outcomes:**

At the end of this course the students will be able to:

| | |
|---|---|
| CO1 | Demonstrate knowledge of the basic elements and concepts related to distributedsystem technologies. |
| CO2 | Demonstrate knowledge of the core architectural aspects of distributed systems |
| CO3 | Demonstrate knowledge of details the main underlying components of distributed systems (such as RPC, file systems); |
| CO4 | Use and apply important methods in distributed systems to support scalability and fault tolerance; |
| CO5 | Demonstrate experience in building large-scale distributed applications. |

**Detailed Syllabus:**

**MODULE-I.**

Introduction to distributed computing system, evolution different models, gaining popularity, definition, issues in design, DCE, message passing –introduction, desirable features of a good message passing

system, issues in IPC, synchronization, buffering, multigram messages, encoding and decoding of message data, process addressing, failure handling, group communication.

**MODULE-II.**

Introduction, model, transparency, implementation mechanism,stubgeneration, RPC messages, marshalling arguments and results, server management, parameter - passing semantics, call semantics, communication protocols for RPCs, client – server binding, exception handling, security, mini project using Java RMI.

**MODULE-III.**

General architecture of DSM systems, design and implementation issues of DSM systems, granularity, structure of shared memory space, consistency model, replacement strategy, thrashing, advantages of DSM, clock synchronization DFS and security- Desirable features of good DFS, file models, file accessing Models, file sharing semantics, file catching schemes, file replication, fault Tolerance, atomic transaction, potential attacks to computer system, cryptography, authentication, access control.Digital signatures, DCE securityservice.

**MODULE-IV.**

Operating Systems, Client-Server Model, Distributed Database Systems, Parallel Programming Languages and Algorithms. Distributed Network Architectures- Managing Distributed Systems. Design Considerations.

**MODULE-V.**

For development, implementation & evaluation of distributed information systems, workflow, software processes, transaction management, and data modeling, infrastructure e.g. middle-ware to glue heterogeneous, autonomous, and partly mobile/distributed data systems, such as e.g. client/server-, CORBA-, and Internet- technologies. Methods for building distributed applications.

**Text / Reference**

1. Pradeep K. Sinha, "Distributed Operating Systems: Concepts Design", 2007
2. Crichlow Joel M, "An Introduction to Distributed and Parallel Computing", PHI, 1997
3. Black Uyless, "Data Communications and Distributed Networks", PHI, 5thEdition,1997

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSP608** | **Software Engineering** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Course objectives –**

1. To develop basic Knowledge in Software Engineering and its applications.

2. To understand software Engineering layered architecture and the process frame work.

3. To analyze software process models such as the waterfall, spiral, evolutionary models and agile method for software development.

4. To design software requirements and specifications of documents.

5. To understand project planning, scheduling, cost estimation, risk management.

6. To describe data models, object models, context models and behavioral models.

7. To learn coding style and testing issues.

8. To know about the quality checking mechanism for software process and product.

**Course outcomes –**

**CO.1 Identify**the principles of large scale software systems, and the processes that are used to build them.

**CO.2 Able**to use tools and techniques for producing application software solutions from informal and semi - formal problem specifications.

**CO.3 Develop** an appreciation of the cost, quality, and management issues involved in software c onstruction.

**CO.4 Implement** design and communicate ideas about software system solutions at different levels.

**CO.5 Establish** the relation with other people in a team, communicating computing ideas effectively in speech and in writing.

**Mapping of course outcomes with program outcomes:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO.1** | 2 | 2 | - | 3 | - | - | - | - | - | - | - | 1 |
| **CO.2** | - | 3 | - | 2 | 1 | - | - | - | - | - | - | - |
| **CO.3** | - | 3 | 3 | - | - | - | - | - | - | - | - | - |
| **CO.4** | 1 | 2 | - | 1 | - | - | - | - | - | 1 | - | - |
| **CO.5** | - | - | - | - | - | 1 | - | 1 | 1 | 1 | 2 | 3 |

**MODULE-I:**

**INTRODUCTION TO SOFTWARE PROCESS**

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Introduction to Agility-Agile process-Extreme programming (XP) Process.

**MODULE-II:**

**REQUIREMENTS ANALYSIS AND SPECIFICATION**

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

**MODULE-III:**

**SOFTWARE DESIGN**

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

**MODULE-IV:**

**TESTING AND MAINTENANCE**

Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering.

**MODULE-V:**

**PROJECT MANAGEMENT**

Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection - Risk Management-Risk Identification-RMMM Plan-CASE TOOLS

**TEXT BOOKS:**

1. Roger S. Pressman, ―Software Engineering – A Practitioner's Approach‖, Seventh Edition, Mc Graw-Hill International Edition, 2010.

2. Rajib Mall, ―Fundamentals of Software Engineering‖, Third Edition, PHI Learning PrivateLimited, 2009.

**REFERENCE BOOKS:**

1. Ian Sommerville, —Software Engineering‖, 9th Edition, Pearson Education Asia, 2011.

2. Pankaj Jalote, —Software Engineering, A Precise Approach‖, Wiley India, 2010.

3. Kelkar S.A., —Software Engineering‖, Prentice Hall of India Pvt Ltd, 2007.

4. Stephen R.Schach, —Software Engineering‖, Tata McGraw-Hill Publishing Company Limited,2007.

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSO609** | **Artificial Intelligence & Machine Learning** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Course objectives -**

The aim of Artificial Intelligence & Machine Learning course is to prepare students for career in computer science & engineering where knowledge of AI & ML techniques leading to the advancement of research and technology. Artificial Int elligence and Machine Learning are the terms of computer science. Machine Learning is the learning in which machine can learn by its ownwithoutbeingexplicitlyprogrammed.ItisanapplicationofAIthatprovidesystemtheability to automatically learn and improve fro mexperience.

**Course Outcomes:** After completing this course the student will be able to:

| | |
|---|---|
| CO1 | Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems. |
| CO2 | Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. |
| CO3 | Demonstrate proficiency in applying scientific method to models of machine learning. |
| CO4 | Discuss the basics of ANN and different optimizations techniques. |

**Mapping of course outcomes with program outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | - | 2 | 2 | - | - | - | - | - | - | - |
| CO2 | 2 | - | 3 | 2 | - | - | - | - | - | - | - | - |
| CO3 | 3 | 2 | - | 3 | - | - | - | - | - | - | - | - |
| CO4 | 2 | - | 1 | - | 3 | - | 2 | - | - | - | - | - |

**Course Detail -**

**MODULE-I:**

**Overview and Search Techniques:** Introduction to AI, Problem Solving, Statespacesearch,Blindsearch:Depthfirstsearch, Breadthfirstsearch,Informedsearch: Heuristic function, Hill climbing search, Best first search, A* & AO* Search, Constraint satisfaction problem; Game tree, Evaluation function, Mini-Max search, Alpha-beta pruning, Games of chance.

**MODULE-II:**

**Knowledge Representation (KR)**: Introduction to KR, Knowledge agent, Predicate logic, Inference rule & theorem proving forward chaining, backward chaining, resolution;Propositionalknowledge,Booleancircuitagents;RuleBasedSystems,Forward reasoning: Conflict resolution, backward reasoning: Structured KR: Semantic Net - slots, inheritance, ConceptualDependency.

**MODULE-III:**

**Handling uncertainty and Learning**: Source of uncertainty, Probabilistic inference,Bayes'theorem,LimitationofnaïveBayesiansystem,BayesianBeliefNetwork (BBN); Machine learning, Basic principal, Utility of ML Well defined learning system, Challenges in ML, Application of ML.

**MODULE-IV:**

**Learning and Classifier:** Linear Regression (with one variable and multiple variables), Decision Trees and issue in decision tree, Clustering (K-means, Hierarchical, etc), Dimensionality reduction, Principal Component Analysis, Anomaly detection, Feasibility of learning, Reinforcement learning.

**MODULE-V:**

**Artificial Neural Networks:** Introduction, Artificial Perceptron's, Gradient Descent and The Delta Rule, Adaline, Multilayer Networks, Back-propagation Rule back-propagation Algorithm-Convergence; Evolutionary algorithm, Genetic Algorithms – An Illustrative Example, Hypothesis Space Search, Swarm intelligence algorithm.

**Text Book:**

1. Artificial Intelligence by Elaine Rich and Kevin Knight, Tata MeGrawHill
2. Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David.Cambridge UniversityPress.
3. Artificial Neural Network, B. Yegnanarayana, PHI,2005

**Reference Book:**

1. Christopher M. Bishop. Pattern Recognition and Machine Learning(Springer)
2. IntroductiontoArtificialIntelligenceandExpertSystemsbyDanW.Patterson,Prentice Hall

ofIndia

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSP604** | **Soft Computing** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Course objective:**

This course will cover fundamental concepts used in Soft computing. Soft Computing refers to a partnership of computational techniques in computer science, artificial intelligence, machine learning and some engineering disciplines, which attempt to study, model, and analyze complex phenomena.TheconceptsofArtificialNeuralNetworks(ANNs)willbecoveredfirst,followedby Fuzzylogic(FL)andoptimizationtechniquesusingGeneticAlgorithm(GA).ApplicationsofSoft Computing techniques to solve a number of real-life problems will be covered to have hands on practices.Insummary,thiscoursewillprovideexposuretotheoryaswellaspracticalsystemsand software used in softcomputing.

**Course outcomes:**

At the end of the course students will be able to:

| | |
|---|---|
| CO1 | **Present** the feasibility of applying a soft computing methodology for specific problem. |
| CO2 | **Identify** and describe soft computing techniques and their roles in building intelligent machines. |
| CO3 | **Apply** neural networks to pattern classification and regression problems. |
| CO4 | **Apply** fuzzy logic and reasoning to handle uncertainty and solve engineering problems. |
| CO5 | **Apply** genetic algorithms to combinatorial optimization problems. |

Mapping of course outcomes with program outcomes:

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 3 | 2 | 3 | - | - | - | - | 1 | - | 2 |
| **CO 2** | 3 | 3 | 2 | 2 | - | - | - | - | 2 | - | - | - |
| **CO 3** | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO 4** | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - |
| **CO 5** | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 |
| **Avg** | 3 | 2.6 | 2.2 | 2 | 2.25 | | | | 2 | 1 | | 2 |

**Detailed Syllabus**

**MODULE-I:**

**INTRODUCTION TO SOFT COMPUTING:**Soft computing: Softcomputing concepts, soft computing versus hard computing, various types of soft computing techniques, applications of soft computing.

**MODULE-II:**

**ARTIFICIAL NEURAL NETWORKS:** Neural Networks: History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training, Algorithms-perceptions; Training rules, Delta, Back Propagation Algorithm, Multilayer PerceptronModel.

**MODULE-III:**

**SPECIAL LEARNING NETWORK:** Competitive learning networks, Kohonen Self-organizing networks, Hebbian learning, Hopfield Networks, Associative memories, The Boltzman machine**,** Applications of Artificial Neural Networks.

**MODULE-IV:**

**FUZZY LOGIC:** Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Qualifiers, Linguistic Hedges, Introduction & features of membership functions.

**MODULE-V:**

**FUZZY RULE BASED SYSTEM:** Fuzzy rule base system: Fuzzy Propositions, implications and inferences, Fuzzy reasoning, Defuzzification techniques, Fuzzy logic controller design, Fuzzy decision making & Applications of fuzzy logic.

**MODULE-VI:**

**GENETIC ALGORITHMS:** Genetic Algorithms: An Overview of Genetic algorithm (GA), Evolution strategies (ES), Evolutionary programming (EP), Genetic programming (GP); GA operators: Encoding, Selection, Crossover, Mutation, schemaanalysis,analysisofselectionalgorithms;convergence;optimization,oftravelling salesman problem using genetic algorithm approach; Markov & other stochastic models. Other Soft Computing Techniques: Simulated annealing, Tabu search, Ant colony-based optimization (ACO),etc.

Text Book:

1. P. R. Beeley, Foundry Technology, Newnes-Buttterworths,2001.
2. P. D. Webster, Fundamentals of Foundry Technology, Portwillis press, Red hill,1980.

SupplementaryReading:

1. P. C. Mukherjee, Fundamentals of Metal casting Technology, Oxford IBH,1980.
2.R. W. Hein, C. R. Loper and P. C. Rosenthal, Principles of Metal casting, Mc Graw Hill,1976.

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: ITO601** | **Information Retrieval** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**OBJECTIVES:** To provide an overview of Information Retrieval systems. Expose them to various retrieval models with emphasis on pros and cons of these models. Discuss mechanisms of web search along with the details of ranking algorithms. Introduce basic concepts of tex t categorization and recommender systems.

**MODULE-I**

Introduction to Information Retrieval: The nature of unstructured and semi -structured text. Inverted index and Boolean queries. Text Indexing, Storage and Compression Text encoding: tokenization; stemming; stop words; phrases; index optimization. Index compression: lexicon compression and postings lists compression. Gap encoding, gamma codes, Zipf's Law. Index construction. Postings size estimation, dynamic indexing, positional indexes, n-gram indexes, real-world issues.

**MODULE -II**

Information Retrieval Models: Boolean; vector space; TFIDF; Okapi; probabilistic; language modeling; latent semantic indexing. Vector space scoring. The cosine measure. Efficiency considerations. Document length normalization. Relevance feedback and query expansion. Rocchio algorithm.

**MODULE -III**

Web Information Retrieval: Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS. Retrieving Structured Documents: XML retrieval, semantic web.

Performance Evaluation of IR systems: Evaluating search engines. User happiness, precision, recall, F -measure. Creating test collections: kappa measure, interjudge agreement.

**MODULE -IV**

Text Categorization and Filtering: Introduction to text classification. Naive Bayes mode ls. Spam filtering. Vector space classification using hyperplanes; centroids; k Nearest Neighbors. Support vector machine classifiers. Kernel functions. Boosting.

**MODULE -V**

Advanced Topics: Summarization, Topic detection and tracking, Personalization, Ques tion answering, Cross language information retrieval (CLIR). Recommender System.

**COURSE OUTCOMES:**

Students will get:

**CO1:** The understanding of different Information retrieval models

**CO2:** To know about evaluation methods of the information retrieval model

**CO3:** Exposures of implementing retrieval models on text data

**CO4:** To know about text categorization and its implementation

**CO5:** To know the challenges associated with each topics on new domain of retrieval and classification

**CO-PO mapping table**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** |
|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | |
| **CO2** | | 1 | 2 | 3 | |
| **CO3** | | | 3 | 2 | 2 |
| **CO4** | 3 | 2 | 3 | | |
| **CO5** | | | 2 | 3 | |

**TEXT BOOKS:**

1. Manning, Raghavan and Schutze, "Introduction to Information Retrieval", Cambridge University Press, 2009.
2. Baeza-Yates and Ribeiro-Neto, "Modern Information Retrieval", Addison Wesley.

**REFERENCES:**

1. Charles L. A. Clarke, Gordon Cormack, and Stefan Büttcher, "Information Retrieval: Implementing and Evaluating Search Engines", MIT Press Cambridge, 2010.
2. Baeza-Yates / Ribeiro-Neto, "Modern Information Retrieval: The Concepts and Technology behind Search", Pearson Education India, 2010.

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CSP607** | **Natural Language Processing** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**OBJECTIVES:** To provide an overview of Information Retrieval systems. Expose them to various retrieval models with emphasis on pros and cons of these models. Discuss mechanisms of web search along with the details of ranking algorithms. Introduce basic concepts of tex t categorization and recommender systems.

**MODULE-I**

Introduction to Information Retrieval: The nature of unstructured and semi -structured text. Inverted index and Boolean queries. Text Indexing, Storage and Compression Text encoding: tokenization; stemming; stop words; phrases; index optimization. Index compression: lexicon compression and postings lists compression. Gap encoding, gamma codes, Zipf's Law. Index construction. Postings size estimation, dynamic indexing, positional indexes, n-gram indexes, real-world issues.

**MODULE -II**

Information Retrieval Models: Boolean; vector space; TFIDF; Okapi; probabilistic; language modeling; latent semantic indexing. Vector space scoring. The cosine measure. Efficiency considerations. Document length normalization. Relevance feedback and query expansion. Rocchio algorithm.

**MODULE -III**

Web Information Retrieval: Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS. Retrieving Structured Documents: XML retrieval, semantic web.

Performance Evaluation of IR systems: Evaluating search engines. User happiness, precision, recall, F -measure. Creating test collections: kappa measure, interjudge agreement.

**MODULE -IV**

Text Categorization and Filtering: Introduction to text classification. Naive Bayes mode ls. Spam filtering. Vector space classification using hyperplanes; centroids; k Nearest Neighbors. Support vector machine classifiers. Kernel functions. Boosting.

**MODULE -V**

Advanced Topics: Summarization, Topic detection and tracking, Personalization, Ques tion answering, Cross language information retrieval (CLIR). Recommender System.

**COURSE OUTCOMES:**

Students will get:

**CO1:** The understanding of different Information retrieval models

**CO2:** To know about evaluation methods of the information retrieval model

**CO3:** Exposures of implementing retrieval models on text data

**CO4:** To know about text categorization and its implementation

**CO5:** To know the challenges associated with each topics on new domain of retrieval and classification

**CO-PO mapping table**

| | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | - | - |
| **CO2** | - | 1 | 2 | 3 | - |
| **CO3** | - | - | 3 | 2 | 2 |
| **CO4** | 3 | 2 | 3 | - | - |
| **CO5** | - | - | 2 | 3 | - |

**TEXT BOOKS:**

3. Manning, Raghavan and Schutze, "Introduction to Information Retrieval", Cambridge University Press, 2009.
4. Baeza-Yates and Ribeiro-Neto, "Modern Information Retrieval", Addison Wesley.

**REFERENCES:**

3. Charles L. A. Clarke, Gordon Cormack, and Stefan Büttcher, "Information Retrieval: Implementing and Evaluating Search Engines", MIT Press Cambridge, 2010.
4. Baeza-Yates / Ribeiro-Neto, "Modern Information Retrieval: The Concepts and Technology behind Search", Pearson Education India, 2010.

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: ITO602** | **Internet of Things** | **L** | **T** | **P** | **C** |
| | | **2** | **1** | **0** | **3** |

**Module I**

**Introduction**

Overview and Motivations, IPv6 Role, IoT Definitions, IoT Frameworks. .

**Module II**

**Prototyping Embedded Devices**

Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Beagle Bone Black, Electric Imp, Other Notable Platforms

**Module III**

**IPv6 Technologies for the IoT**

Overview and Motivations, Address Capabilities, IPv6 Protocol Overview, IPv6 Tunnelling, IPsec in IPv6, Header Compression Schemes, Quality of Service in IPv6,Migration Strategies to IPv6

**Module IV**

**Evolving IoT Standards**

Overview and Approaches, IETF IPv6 Routing Protocol for RPL Roll, Constrained Application Protocol (CoAP) , Representational State Transfer (REST) , ETSI M2M , Third -Generation Partnership Project Service

Requirements for Machine-Type Communications , CENELEC, IETF IPv6 Over Lowpower WPAN (6LoWPAN) , ZigBee IP (ZIP), IP in Smart Objects (IPSO)

**Module V**

**Prototyping Online Components**

Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols: MQTT, Extensible Messaging and Presence Protocol

**Module VI**

**IoT Application Examples**

Overview, Smart Metering/Advanced Metering Infrastructure, e-Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking (Following and Monitoring Mobile Objects),Over-The-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications

Textbooks:

1. Building the Internet of Things with IPv6 AND MIPv6 by DANIEL MINOLI Published by John Wiley & Sons, Inc., Hoboken, New Jersey.(UNIT-I, III, V, VI)
2. Designing the Internet of Things by Adrian McEwen and Hakim Cassimally Published by John Wiley & Sons (UNIT-II, IV)

References:

1. Getting Started with the Internet of Things by CunoPfister Published by O'Reilly Media, Inc.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things" Key

**Course Outcomes:**

After completion of course students will be able to

| **COs** | **COs in detail** |
|---|---|
| **CO1** | Explain the concept of IoT |
| **CO2** | Illustrate key technology, protocols and standard of IoT |
| **CO3** | Analyse trade-off in interconnected wireless embedded device networks |
| **CO4** | Understand application of IoT in automation of commercial and real world example |
| **CO5** | Design a simple IoT System comprising sensors, edge devices and wireless network involving prototyping, programming and data analytics |

**CO-PO mapping**

| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **1** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** |
| **CO2** | **3** | **_** | **1** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** |
| **CO3** | **2** | **_** | **1** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** |
| **CO4** | **3** | **_** | **2** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO5** | **3** | **_** | **2** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** | **_** |

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CS601P** | **Computer Networks Lab** | **L** | **T** | **P** | **C** |
| | | **0** | **0** | **2** | **1** |

**List of Experiments:**

1. Study of Network Devices in detail and to connect the computers in Local Area Network.
2. Study of IP and to Configure Host IP, Subnet Mask and Default Gateway in a system in LAN (TCP/IP Configuration).
3. Study of different types of Network cables and to implement the cross -wired cable and straight through cable in a network.
4. Implementation of basic network command and Network configuration comm ands.
5. Performing an Initial Switch Configuration.
6. Performing an Initial Router Configuration.
7. Configuring and Examining Network Address Translation (NAT).
8. Configuring Ethernet and Serial Interfaces.
9. Configuring Routing Information Protocol (RIP).
10. Configuring a Cisco Router as a DHCP Server.

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CS602P** | **Data Science Lab** | **L** | **T** | **P** | **C** |
| | | **0** | **0** | **2** | **1** |

**List of Experiments:**

1. Basic Python or R programming
   a. Program to add two numbers
   b. Maximum of two numbers
   c. Program for factorial of a number
   d. Program to check Armstrong number
2. Array Programming
   a. Program to find sum of array
   b. Program to reverse an array

   c. Program to find largest element of an array
3. List programming
   a. Program to swap two elements in a list
   b. Program to find sum of numbers in a list
   c. Program to find even numbers in a list
   d. Program to do cumulative sum of a list
4. Matrix program
   a. Program to add two matrices
   b. Program to multiply two matrices
   c. Program to find transpose of matrix
   d. Program to subtract matrices
5. Dictionary program
   a. Program to find sum of all items in a dictionary
   b. Program to merge two dictionary
   c. Program to remove all duplicate words in a sentence
6. Tuple program
   a. Program to find the size of tuple
   b. Program to find Maximum and minimum element in tuple
   c. Program to extract digits from a tuple list
   d. Program to remove tuple of K-length
7. Searching and sorting program
   a. Program for insertion sort
   b. Program Merge sort
   c. Program for Bubble sort
   d. Program for Quick sort
8. File handling program
   a. Program to read file one by one
   b. Program to remove lines starting with any prefix
   c. Program to merge two file to a third file
9. Use Data sets for analysis
   a. Use Iris Data set to perform PCA and do your analysis on different flowers with different sepal and petal length & width.
   b. Use Titanic Data set to find any analysis on death rate with gender and age
   c. Use House price data set to do house price prediction
10. Use Image/text data set for analysis
   a. Use Lungs image data for segmentation
   b. Use any image data set you want to go for feature extraction and dimensionality reduction.
   c. Document classification on any available dataset

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CS603P** | **Image Processing Lab** | **L** | **T** | **P** | **C** |
| | | **0** | **0** | **2** | **1** |

**List of Experiments**

1. Distance and Connectivity

2. Image Arithmetic
3. Affine Transformation
4. Point Operations
5. Neighborhood Operations
6. Image Histogram
7. Fourier Transform
8. Color Image Processing
9. Morphological Operations
10. Image Segmentation
11. Image Processing Test Bench

| **Computer Science & Engineering** | | | | | |
|---|---|---|---|---|---|
| **Code: CS604P** | **Soft Computing Lab** | **L** | **T** | **P** | **C** |
| | | **0** | **0** | **2** | **1** |

**List of Experiments:**

1. To perform Union, Intersection and Complement operations in Fuzzy Logic.
2. To implement De-Morgan's Law.
3. To plot various Membership Functions in Fuzzy Logic.
4. Implementation of Fuzzy Relations using Max -Min Composition method.
5. Implementation of Fuzzy Controller using FIS (Washing Machine).
6. To generate Activation Functions that are being used in Neural Networks.
7. To generate the output of ANDNOT function using McCulloch -Pitts Neural Network.
8. To generate the output of XOR function using McCulloch -Pitts Neural Network.
9. To classify two-dimensional input patterns inbipolar with given targets using Hebb Net.

Computer Science & Engineering

**Semester -VII**

**Branch: Computer Science & Engineering**

| S.N. | Code | Course Title | Lecture | Tutorial | Practical | Credits |
|---|---|---|---|---|---|---|
| 1 | CSC701 | Artificial Intelligence | 3 | 0 | 0 | 3 |
| 2 | PEC-III | **Professional Elective -III** | 3 | 0 | 0 | 3 |
| 3 | PEC-IV | **Professional Elective -IV** | 3 | 0 | 0 | 3 |
| 4 | OEC III | **Open Elective -III** | 3 | 0 | 0 | 3 |
| 5 | OEC IV | **Open Elective -IV** | 3 | 0 | 0 | 3 |
| 6 | CS701P | Artificial Intelligence Lab. | 0 | 0 | 2 | 1 |
| 7 | CS702D | Project-I | 0 | 0 | 4 | 2 |
| 8 | CS703I | Internship Assessment II | 0 | 0 | 2 | 2 |
| | | | | | **Total credits** | 20 |

| **Code** | **Professional Elective-III (Any one)** | **Code** | **Professional Elective- IV (Any one)** |
|---|---|---|---|
| CSP702 | Machine Learning | ITP705 | Data Mining and Data Warehousing. |
| CSP703 | Multimedia and Applications | ITP706 | Information Security. |
| CSP704 | Human Computer Interaction | CSP707 | Computer Vision |

| **Code** | **Open Elective-III (Any one)** | **Code** | **Open Elective-IV(Any one)** |
|---|---|---|---|
| ITO708 | Software Engineering | ITO711 | Information Security |
| CSO709 | Values and Ethics in Profession. | CSO712 | Cryptography |
| CSO710 | *Data Mining | ITO713 | Knowledge Domain Development |

* Not for CSE Students

**Semester -VIII**

**Branch: Computer Science & Engineering**

| S.N. | Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | CS801D | Project-II | | | 16 | 08 |
| | | | | | Total Credit | 08 |

**NOTE- A Student can be allowed to do project outside after the permission of departmental Academic Committee. Those students doing project outside has present their project progress every month. Those students doing project outside can be permitted to present progress every fortnight though video conferencing. Students doing project in house has present their project progress every week.**

| Computer Science & Engineering and Information Technology | | | | | |
|---|---|---|---|---|---|
| **Code: CSC701** | **Artificial Intelligence** | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |

## COURSE OUTCOME

**CO.1: Discuss** basic concepts of Artificial Intelligence, AI(Artificial Intelligence) principles, AI Task domains and application.
**CO.2: Explain** various searching techniques, constraint satisfaction problem, game playing techniques and **Apply** these techniques in applications which involve perception, reasoning and learning.
**CO.3: Explain** various searching techniques, constraint satisfaction problem, game playing techniques and **Apply** these techniques in applications which involve perception, reasoning and learning.
**CO.4: Explain** working of uncertainty management, decision making and learning methods.
**CO.5: Apply** different knowledge representation, reasoning, and learning techniques to real-world problems.

**CO-PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | P10 | P11 | P12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO.1** | 3 | - | - | - | - | - | - | - | - | - | - | 3 |
| **CO.2** | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - |
| **CO.3** | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - |
| **CO.4** | 3 | - | - | - | - | - | - | - | - | - | - | 2 |
| **CO.5** | - | 2 | 2 | 2 | - | - | - | - | - | - | - | - |

**3: high, 2: moderate, 1 low*

## MODULE 1:

### Introduction

Overview of AI, Problems of AI, AI techniques, Problem Solving, Problem Space and Search, Defining the problem as state space search, Problem characteristics; Tic,Tac,Toe Problem

### AI languages

Basic knowledge of AI programming languages like Prolog and Lisp .

## MODULE 2:

### Basic Search Techniques

Solving Problems by searching; Uniform search strategies; Breadth first search, depth first search, depth limited search, bidirectional search, Best First search, comparing search strategies in terms of complexity.

**MODULE 3:**

**Special Search Techniques**

Heuristic Search, greedy best,first search, A* search; Hill climbing search, Simulated Annealing search; Genetic Algorithm; Constraint Satisfaction Problems; Adversarial search, Games, Optimal decisions and strategies in games, Minimax search, Alpha,beta pruning.

**Symbolic Logic**

Syntax and semantics for propositional logic, Syntax and semantics of FOPL, Properties of WFF, Clausal form, Unification, Resolution.

**MODULE 4:**

**Reasoning Under Inconsistencies and Uncertainties :**

Non,monotonic reasoning, Truth Maintainace System, Default Reasoning & closed world assumption, Predicate completion and circumscription, Fuzzy Logic.

**Probabilistic Reasoning**

Bayesian probabilistic inference, Representation of knowledge in uncertain domain, Semantics of Bayesian networks, Dempster, Shafer theory.

**MODULE 5:**

**Structured Knowledge**

Associative networks, Conceptual graphs, Frames structures.

**Expert Systems**

Rule based systems, Non production systems : decision tree architectures, black board system architecture, neural network architecture.

**Learning**

Types of learning, general learning model, Learning by induction; generalization, specialization, example of inductive learner.

**Text book:**

1. Elaine Rich, Kevin Knight and Shivashankar B Nair, “Artificial Intelligence”, Mc Graw Hill Publication, 2009.
2. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert System”, Pearson Publication,2015.

**References:**

1. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning, 2011.

| Computer Science & Engineering and Information Technology | | | | | |
|---|---|---|---|---|---|
| **CSP702** | **Machine Learning** | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |

**Course Outcome**: At the completion of the course a student will be able to –

1. Discuss fundamental of machine learning, design and its application.
2. Differentiate various learning approaches, and to interpret the concepts of different learning.
3. Illustrate and apply clustering algorithms and identify its applicability in real life problems.
4. Discuss basics of neural network and its different model.
5. Describe different optimizations algorithm.

## CO-PO Mapping-

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **3** | **1** | **2** | | | | | | | |
| **CO2** | **3** | **2** | **3** | **1** | | | | | **1** | | | **2** |
| **CO3** | **3** | **3** | **2** | **2** | **1** | | | | | | | |
| **CO4** | **3** | **2** | **2** | | **2** | | | | | | | |
| **CO5** | **2** | **2** | **3** | **1** | **2** | | | | | | | |

**MODULE** 1: What is Machine learning, Basic principal, Utility of ML Well defined learning system, Designing learning system, Challenges in ML, Application of ML.

**MODULE 2:** Linear Regression (with one variable and multiple variables), Gradient Descent, Classification (Logistic Regression, Over fitting, Regularization, Support Vector Machines), Decision Trees and issue in decision tree, Bayesian Learning – Bayes Theorem, Concept Learning, Bayes Optimal Classifier, Naïve Bayes Classifier, Bayesian Belief Networks, EM Algorithm.

**MODULE 3:**

Clustering (K-means, Hierarchical, etc.), Dimensionality reduction, Principal Component Analysis, Anomaly detection, Feasibility of learning, Reinforcement learning.

**MODULE 4**:

Artificial Neural Networks, Artificial Perceptron's, Gradient Descent and The Delta Rule, Adaline, Multilayer Networks, Back-propagation Rule back-propagation Algorithm-Convergence.

**MODULE 5**:

Evolutionary algorithm, Genetic Algorithms – An Illustrative Example, Hypothesis Space Search, Genetic Programming, Swarm intelligence algorithm.

**Text Book:**

1. Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press.

2. Tom Mitchell. Machine Learning (McGraw Hill)

3. Artificial Neural Network, B. Yegnanarayana, PHI, 2005

**Reference Book:**

1. Christopher M. Bishop. Pattern Recognition and Machine Learning (Springer)

| Computer Science & Engineering and Information Technology | | | | | |
|---|---|---|---|---|---|
| **CSP703** | **MULTIMEDIA SYSTEMS AND APPLICATIONS** | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |

## Course Outcome:

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

1. Developed understanding of technical aspect of Multimedia Systems.
2. Understand various file formats for audio, video and text media.
3. Develop various Multimedia Systems applicable in real time.
4. Design interactive multimedia software.
5. Apply various networking protocols for multimedia applications.
6. To evaluate multimedia application for its optimum performance.

## Syllabus:

**MODULE 1:**

Introduction to Multimedia System: Architecture and components, Multimedia distributed processing model, Synchronization, Orchestration and Quality of Service (QOS) architecture.

**MODULE 2:**

Audio and Speech: Data acquisition, Sampling and Quantization, Human Speech production mechanism, Digital model of speech production, Analysis and synthesis, Psycho-acoustics, low bit rate speech compression, MPEG audio compression.

**MODULE 3:**

Images and Video: Image acquisition and representation, Composite video signal NTSC, PAL and SECAM video standards, Bilevel image compression standards: ITU (formerly CCITT) Group III and IV standards, JPEG image compression standards, MPEG video compression standards.

**MODULE 4:**

Multimedia Communication: Fundamentals of data communication and networking, Bandwidth requirements of different media, Real time constraints: Audio latency, Video data rate, multimedia over LAN and WAN, Multimedia conferencing.

**MODULE 5:**

Multimedia Information Systems: Operating system support for continuous media applications: limitations is usual OS, New OS support, Media stream protocol, file system support for continuous media, data models for multimedia and hypermedia information, content based retrieval of unstructured data.

**Text / Reference Books**


1. Ralf Steinmetz and Klara Nahrstedt, Multimedia Systems, Springer.
2. J. D. Gibson, Multimedia Communications: Directions and Innovations, Springer.
3. K. Sayood, Introduction to Data Compression, Morgan-Kaufmann.
4. A. Puri and T. Chen, Multimedia Systems, Standards, and Networks, Marcel Dekker.
5. Iain E.G. Richardson, H.264 and MPEG-4 Video Compression, John Wiley.
6. Borivoje Furht, Handbook of Multimedia Computing, CRC Press.

| Computer Science & Engineering and Information Technology | | | | | |
|---|---|---|---|---|---|
| **ITP705** | **Data Mining and Data Warehousing** | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |

**Course Outcomes**

1. Establish the relation between data warehousing and data mining.
2. Able to comprehend multi-dimensional structure of data model.
3. Able to identify the need for analysis of large, complex, information-rich data sets.
4. Identify the goals and primary tasks of the data mining process.
5. Recognize the iterative character of a data process and specify its basic steps.

**CO-PO Mapping**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 2 | 3 | 2 | - | - | - | - | - | 1 | - | - |
| **CO 2** | | | | | | | | | | | | |
| **CO3** | 3 | 3 | 1 | - | 3 | 3 | 3 | 2 | 3 | - | - | 2 |
| **CO4** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 1 |
| **CO5** | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - |

**Syllabus**

**MODULE 1:**

Introduction :

Data warehousing-definitions and characteristics, Multi-dimensional data model, Warehouse schema.

Data Marts : Data marts, types of data marts, loading a data mart, metadata, data model. Maintenance, nature of data, software components; external data, reference data, performance issues, monitoring requirements and security in a data mart.

**MODULE 2:**

Online Analytical Processing: OLTP and OLAP systems, Data Modeling, LAP tools, State of the market, Arbor Essbase web, Microstrategy DSS web, Brio Technology, star schema for multi dimensional view, snowflake schema, OLAP tools.

**MODULE 3:**

Developing a Data Warehousing : Building of a Data Warehousing, Architectural strategies & organizational issues, design considerations, data content, distribution of data, Tools for Data Warehousing.

**MODULE 4:**

Data Mining : Definitions; KDD (Knowledge Discovery database) versus Data Mining; DBMS versus Data Mining, Data Mining Techniques; Issues and challenges; Applications of Data Warehousing & Data mining in Government.

Association Rules: Apriori algorithms. Partition algorithm, Dynamic itemset counting algorithm, FP- tree growth algorithm, Generalized association rule.

**MODULE 5:**

Clustering Techniques :Clustering paradigm, Partition algorithms, CLARA, CLARANS, Hierarchical clustering, DBSCAN, BIRCH, CURE; Categorical Clustering, STIRR, ROCK, CACTUS.

Decision Trees : Tree construction principle, Best split, Splitting indices, Splitting criteria, Decision tree construction with presorting.

**MODULE 6:**

Web Mining: Web content Mining; Web structure Mining; Web usage Mining; Text mining.

**MODULE 7:**

Temporal and Spatial Data Mining: Basic concepts of temporal data mining, The GSP algorithm, SPADE, SPIRIT, WUM.

**Books**


1. Data Warehousing, Reema Thareja
2. Data mining - Concepts & Techniques, Jiawei Han, Micheline Kamber, Morgan Kaufmann ,2nd Ed.2006.
3. Oracle 8i Data Warehousing, Michale Corey, Michale Abbey, Tata McGraw Hill
4. Fundamentals of Database Systems, Navathe and Elmasry, Addison Wesley, 2000
5. Data Mining, Arun Pujari Orient Longman, 2003

| Computer Science & Engineering and Information Technology | | | | | |
|---|---|---|---|---|---|
| **ITP706** | **INFORMATION SECURITY** | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |

**Course Outcomes:** At the end of the course the student will be able to:

CO1 Recognize propensity of errors and remedies in processes involving information technology

CO2 Consummate knowledge of risk and controls in IT operation in industry

CO3 Determine IT security guidelines for various type of industries

CO4 Evaluate asset safeguarding, data integrity, system effectiveness and system effici ency.

CO5 Understand software security auditing including database security audit, network security audit and micro-computer security audit.

**Mapping of course outcomes with program outcomes**

| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | | 2 | | 3 | | 1 | | 2 | |
| CO2 | | 2 | | 3 | | 1 | | 2 | |
| CO3 | | 2 | | 3 | | 1 | | 2 | |
| CO4 | | 2 | | 3 | | 1 | | 2 | |
| CO5 | | 2 | | 3 | | 1 | | 2 | |

**Detailed syllabus:**

**Module1**

Computer Auditing- System Access control, Data Access Control, Security Administration, System Design.

**Module 2**

Hardware Security Controls - The Total System Needs Securing, Levels of Hardware Controls, Operating System Controls , Access Controls, General-Purpose Operating Systems Security , Sources of Additional Information

**Module 3**

Software Controls - Software Security and Controls, Types of Software Intrusions, Configuration Management , Modularity and Encapsulation, Protecting Information, Selecting Security Software, Analysis of Software Products Database Security - Introduction to Databases, Security Requirements of Databases, Designing Database Security.

**Module 4**:

Methods of Protection, Security of Multilevel Databases,The Future of Databases. Network and Telecommunication Security - Telecommunications and Networks, Security Considerations, Cases in Point, Special Communications, Security Considerations.

**Module 5:**

Microcomputer Security - Microcomputer Problems and Solutions , The Microcomputer Environment , Security of Microcomputers, Internal Data Security, The Threats to Micros, Developing a Micro Security Plan, Establishing a Micro-to-Mainframe Link , Portable Microcomputer Security , Password Protection, Security of Special Micro Applications.

**Reading:**

1. Deborah Russell, *Computer Security Basics*, O'Reilly & Associate, 1991.
2. Karen A. Forcht, *Computer Security Management*, Boyd & Fraser Publishing Co., 1994.
3. Donald A. Watne, Peter B.B. Turney, *Auditing EDP Systems*, 2nd Edition, PH 1990

| Computer Science & Engineering and Information Technology | | | |
|---|---|---|---|
| **Code: CSP707** | **Computer Vision** | **L** | **T** |
| | | **3** | **0** |

**Objectives:**

Computer Vision focuses on development of algorithms and techniques to analyze and interpret the visible world around us. This requires understanding of the fundamental concepts related to multi-dimensional signal processing, feature extraction, pattern analysis visual geometric modeling, stochastic optimization etc. Knowledge of these concepts is necessary in this field, to explore and contribute to research and further developments in the field of computer vision. Applications range from biometrics, medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.

**Course Outcomes**

After completion of the course students will be able

| **COs** | **Course outcome description** |
|---|---|
| **CO1** | To apply mathematical modeling methods for low-, intermediate- and high-level image processing tasks. |
| **CO2** | To design new algorithms to solve recent state of the art computer vision problems. |
| **CO3** | To perform software experiments on computer vision problems and compare their performance with the state of the art. |
| **CO4** | To develop a broad knowledge base so as to easily relate to the existing literature. |
| **CO5** | To gather a basic understanding about the geometric relationships between 2D images and the 3D world. |
| **CO6** | To build a complete system to solve a computer vision problem. |

**Detail Syllabus:**

**MODULE-I**

**Digital Image Formation and low-level processing**: Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc.; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

**MODULE-II**

**Depth estimation and Multi-camera views**: Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration.

**MODULE-III**

**Feature Extraction**: Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

**MODULE-IV**

**Image Segmentation**: Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.

**MODULE-V**

**Pattern Analysis:** Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.

**MODULE-VI**

**Motion Analysis**: Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

**Textbook**


1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, 2nd Edition, Cambridge University Press, March 2004.


**Reference book**


1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006
3. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992.
4. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.

| Computer Science & Engineering and Information Technology | | | | | |
|---|---|---|---|---|---|
| **CSO709** | **Values and Ethics in Profession** | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |

**Course Outcomes:**

- **CO1** Identify the effects of technological growth on the society and the limited natural resources.
- **CO2** Identify the essence of sustainable development, and will be able to apply approaches to handle energy crisis and environment protection.
- **CO3** Analyze the impact of technology transfer and the problems of man machine interaction for the human operators in engineering projects and industries.
- **CO4** Apply industrial standards, code of ethics and role of professional ethics in engineering field.
- **CO5** Assess the possible values crisis at different levels and the way out with the help of the constitution and moral, and ethical values.

**CO-PO Mapping:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | P10 | P11 | P12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IT6105.1** | - | - | 2 | - | - | 2 | 3 | - | - | - | - | - |
| **IT6105.2** | - | - | 3 | - | - | - | 3 | - | - | - | - | - |
| **IT6105.3** | - | - | 1 | - | 2 | - | 2 | 2 | - | - | - | - |
| **IT6105.4** | - | - | 3 | - | 2 | 3 | - | 3 | - | - | - | - |
| **IT6105.5** | - | - | 1 | - | 2 | 3 | - | 3 | - | - | - | - |
| **Average** | | | 2 | | 1.2 | 1.6 | 1.6 | 1.6 | | | | |

#3 highly, #2 moderate and #1 low

**Module-1**

Science, Technology and Engineering as Knowledge and as Social and Professional Activities, Effects of Technological Growth: Rapid Technological growth and depletion of resources. Reports of the Club of Rome. Limits of growth; sustainable development, Energy Crisis; Renewable Energy Resources.

**Module-2**

Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations. Environmental Ethics, Appropriate Technology Movement of Schumacher: later developments

**Module-3**

Technology and developing nations. Problems of Technology transfer. Technology assessment, impact analysis. Human Operator in Engineering projects and industries. Problems of man machine interaction. Impact of assembly line and automation. Human centered Technology.

**Module-4**

Ethics of Profession

Engineering profession: Ethical issues in engineering practice. Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond. Case studies.

**Module-5**

Profession and Human Values

Value Crisis in contemporary society, Nature of values: Value Spectrum of a 'good' life, Psychological values: Integrated personality; mental health, Societal values: The modern search for a 'good' society, justice, democracy, secularism, rule of law; values in Indian Constitution, Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity - Moral and ethical values: Nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

**Suggested Text Books:**


1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Edition)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.


**Suggested Reference Books:**


1. Mike Martin and Ronald Schinzinger, "Ethics in Engineering", McGraw-Hill, New York, 2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Thompson Learning, 2000.
3. Govindarajan M, Natarajan S., Senthil Kumar V. S., "Engineering Ethics", Prentice Hall of India, New Delhi 2004.
4. Charles D Fledderman, Engineering Ethics", Prentice Hall, New Mexico, 1999.
5. Edmund G Seebauer and Robert L Barry, Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
6. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, 2003.

| Computer Science & Engineering and Information Technology | | | | | |
|---|---|---|---|---|---|
| **ITO708** | Software Engineering | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |

Course Outcomes:

- Ability to identify the minimum requirements for the development of application.
- Ability to develop, maintain, efficient, reliable and cost effective software solutions
- Ability to critically thinking and evaluate assumptions and arguments**.**

**MODULE- I:** Introduction to Software Engineering:The evolving role of software, Changing Nature of Software, legacy software, Software myths. A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI).

**MODULE 2:** Process patterns, process assessment, personal and team process models. Process models: The waterfall model, Incremental process models, Evolutionary process models, Specialized process models, The Unified process.

**MODULE 3:** Software Requirements:Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. Requirements engineering process: Feasibility studies, Requirements elicitation and analysis.

**MODULE 4**
Requirements validation, Requirements management. System models: Context Models, Behavioral models, Data models, Object models, structured methods.

**MODULE 5**: Design Engineering:Design process and Design quality, Design concepts, the design model, pattern based software design. Creating an architectural design: software architecture, Data design, Architectural styles and patterns, Architectural Design, assessing alternative architectural designs, mapping data flow into a software architecture. Modeling component-level design: Designing class-based components, conducting component-level design, object constraint language, designing conventional components. Performing User interface design: Golden rules, User interface analysis, and design, interface analysis, interface design steps, Design evaluation.

TEXT BOOKS:

- Software engineering A practitioner's Approach, Roger S Pressman, sixth edition McGraw Hill International Edition.
- Software Engineering, Ian Sommerville, seventh edition, Pearson education.

REFERENCE BOOKS:

- Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
- Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
- Fundamentals of Software Engineering, Rajib Mall, PHI, 2005
- Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
- Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.
- Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition 2006.
- Software Engineering Foundations, Yingxu Wang, Auerbach Publications, 2008.
- Software Engineering Principles and Practice, Hans Van Vliet, 3rd edition, John Wiley &Sons Ltd.
- Software Engineering 3: Domains, Requirements, and Software Design, D. Bjorner, Springer International Edition.
- Introduction to Software Engineering, R. J. Leach, CRC Press.

| Computer Science & Engineering and Information Technology | | | | | |
|---|---|---|---|---|---|
| **CSO712** | **CRYPTOGRAPHY** | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |

**Course Outcome:**

| | |
|---|---|
| **.1** | Explain the basics of network security and compare various encryption techniques. |
| **.2** | Summarize the functionality of public key cryptography |
| **.3** | Apply various message authentication functions and secure algorithms |
| **.4** | Demonstrate different types of security systems and describe different levels of security and services. |

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IT6103.1** | - | - | - | - | 2 | - | - | - | - | 1 | - | 1 |
| **IT6103.2** | - | 2 | - | - | 2 | - | - | - | - | - | - | - |
| **IT6103.3** | 3 | 2 | - | - | 2 | 1 | - | - | - | - | 1 | - |
| **IT6103.4** | - | 3 | 1 | - | - | 2 | - | 3 | - | - | - | - |
| **Average** | 0.75 | 1.75 | 0.25 | 0 | 1.5 | 0.75 | 0 | 0.75 | 0 | 0.25 | 0.25 | 0.25 |

**Course Description:**

**MODULE 1:**

**Conventional Encryption and Message Confidentiality**: Conventional Encryption Principles, Conventional Encryption Algorithms, Location of Encryption Devices, Key Distribution

**MODULE 2:**

**Public key cryptography and Message Authentication:** Approaches to Message Authentication, SHA-1, MD5, Public key cryptography Principles, RSA, Digital Signatures, Key Management

**MODULE 3:**

**Network Security Applications**: Kerberos Motivation, Kerberos version 4, PGP Notation, PGP Operational Description

**MODULE 4:**

**IP Security:** IP Security Overview, IP Security Architecture, Authentication Header

**Web Security:** Web Security Threats, Web Traffic Security Approaches, Overview of Secure Socket Layer and Transport Layer Security, Overview of Secure Electronic Transaction

**MODULE 5:**

**Intruders and Viruses:** Intruders, Intrusion Techniques, Password Protection, Password selection Strategies, Intrusion Detection, Malicious Programs**,** Nature of viruses, Types of viruses, Macro viruses, Antivirus Approaches

**Firewalls:** Firewall characteristics, Types of Firewalls, Firewall configuration

**Suggested Text Books:**

1. **"Cryptography and Network Security Principles and Practices", Fourth Edition, William Stallings. Publisher: Prentice Hall**
2. **"Cryptography And Network Security", McGraw Hill, Behrouz A *Forouzan***

| Computer Science & Engineering and Information Technology | | | | | |
|---|---|---|---|---|---|
| **ITO713** | **Knowledge Driven Development (KDD)** | **L** | **T** | **P** | **C** |
| | | **3** | **0** | **0** | **3** |

**Course objective:**

Managing knowledge in a software project is a challenge. Waterfall methodology places emphasis on exhaustive documentation, which is difficult to be kept updated with the dynamics project delivery environment. Agile relies mostly on user stories and acceptance criteria for knowledge management which is flexible but may not be exhaustive.

KDD digitises the knowledge currently contained in the project documents into a specified number of building blocks represented in inventory relationship format. For the implementation aspects, it follows Agile way of working. By digitising knowledge, KDD brings in the next level of maturity in the project delivery that takes it closer to effective implementation of digital transformation programmes using enablers such as Machine Learning, Artificial Intelligence, Data Analytics, Cloud.

**Course outcome:**

After completing this course, students will acquire:

1. A general understanding of how IT projects are delivered by IT companies.
2. Details of a new project delivery methodology (Knowledge driven development – KDD) based on digitisation of project knowledge.
3. How KDD may assist Waterfall, Agile and DevOps methodologies.
4. The potential contribution of KDD in the current wave of digitisation that industry is undergoing.
5. Application of KDD in digitising domain knowledge and enterprise knowledge.

**Course syllabus:**

**MODULE 1:** Project delivery and supporting methodologies (4 hrs)

- IT Industry from technology and domain perspective
- Information technology – a knowledge-based industry
- IT project delivery – An introduction
- IT project delivery methodology landscape

**MODULE 2 :** Project delivery pain areas and the way forward (4 hrs)

- IT project failures
- Project delivery pain areas
- Project knowledge
-

**MODULE 3**. Project knowledge model – context and definition (5 hrs)

- Traditional project knowledge management
- Project delivery activities and project knowledge
- Project knowledge model – Definition
- Project knowledge model – An example

**MODULE 4**: Extending project knowledge model to cover end to end project delivery – KDD (10 hrs)

- KDD focus area and core value
- End to end project delivery using quality gate
- Tracking project delivery quality through Key process indicators (KPI)
- Fitment for different types of Domains and Projects
- KDD Differentiator
- Contrasting KDD with Agile and Waterfall methodologies

**MODULE 5:** KDD Compliance with standards of project delivery (10 hrs)

- Quality assurance framework
- Project management framework
- Service management framework
- Enterprise architecture framework
- Test management framework
- Addressing contemporary concerns of project delivery
- Assisting Waterfall, Agile and DevOps
- Positioning of KDD in the digital era

6. Global relevance of KDD (8 hrs)

- KDD and generic knowledge management framework
- Examples of generic knowledge management framework
- Generic knowledge management framework – its potential usage in skill development
- Towards another ontology framework

**Recommended text-book:**

Knowledge Driven Development – Bridging Waterfall and Agile Methodologies, Published jointly by Cambridge University Press and IISc Press.

**References:**

1. Agile Manifesto: http://agilemanifesto.org/

2. Scrum guide: https://www.scrumalliance.org/learn-about-scrum/the-scrum-guide

| Computer Science & Engineering | | | |
|---|---|---|---|
| **CSO710** | **Data Mining** | **L** | **T** |
| | | **3** | **0** |

**Course Outcomes**

**The students shall able to:**

CO1.**Analyze** different data models used in data warehouse.
CO2. **Apply** different preprocessing techniques for different attributes.
CO3. **Determine** frequent item set using association rules.
CO4**. Apply** different classification techniques to classify the given data set.
CO5. **Analyze** different clustering techniques.

**CO-PO mapping**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | 1 | 1 | 1 | | | | | |
| **CO2** | 3 | 2 | 2 | | 1 | 1 | | 1 | | | | 1 |
| **CO3** | 3 | 2 | 2 | | 1 | | | 1 | 1 | | | |
| **CO4** | 3 | 2 | 2 | | 1 | | 1 | | 1 | | | |
| **CO5** | 3 | 2 | 2 | | 1 | | 1 | 1 | 1 | | 1 | 1 |
| | 3 | 2 | 2 | | 1 | 1 | 1 | 1 | 1 | | 1 | 1 |

**Module - 1**

Data warehousing and online analytical processing: Data warehousing: Basic concepts, Data warehouse modeling: Data cube and OLAP, Data warehouse design and usage, Data warehouse implementation, Data generalization by attribute-oriented induction.

**Module – 2**

Introduction and Data Preprocessing :Why data mining, What is data mining, What kinds of data can be mined, What kinds of patterns can be mined, Which Technologies Are used, Which kinds of Applications are targeted, Major issues in data mining .Data Preprocessing: An overview, Data cleaning, Data integration, Data reduction, Data transformation and data discretization.

**Module – 3**

Classification: Basic Concepts: Basic Concepts, Decision tree induction, Bays Classification Methods, Rule-Based classification, Model evaluation and selection, Techniques to improve classification accuracy.

**Module– 4**

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods: Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting?—Pattern Evaluation Methods, Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining.

**Module – 5**

Cluster Analysis: Basic concepts and methods: Cluster Analysis, Partitioning methods, Hierarchical Methods, Density-based methods, Grid-Based Methods, Evaluation of clustering.

**Text Book:**

**1.** Jiawei Han, Micheline Kamber, Jian Pei: Data Mining Concepts and Techniques, ELSEVIER (MK) 3rd edition 2012.

**Reference Books:**

1.Arun K Pujari: Data Mining Techniques 2nd Edition, Universities Press, 2009.
2. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.
3.Alex Berson and Stephen J. Smith: Data Warehousing, Data Mining, and OLAP Computing, Mc GrawHill Publisher, 1997.
4. Insight into Data Mining – Theory and Practice – K.P.Soman, Shyam Diwakar, V.Ajay, PHI, 2006.

| Computer Science & Engineering | | | |
|---|---|---|---|
| **CSP704** | **Human Computer Interaction** | **L** | **T** |
| | | **3** | **0** |

COURSE OUTCOMES

CO. 1: Explain the capabilities of both humans and computers from the viewpoint of human information processing.
CO. 2: Understand the design technologies for individuals and persons with disabilities
CO. 3: Analyze and Design real time application in mobile HCI and Web Interface.
CO. 4: Describe typical human–computer interaction (HCI) models and styles, as well as various historic HCI paradigms.

Module I : FOUNDATIONS OF HCI

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

Module II : DESIGN & SOFTWARE PROCESS

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

Module III : MODELS AND THEORIES

Cognitive models –Socio-Organizational issues and stake holder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

Module IV : MOBILE HCI

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Module V : WEB INTERFACE DESIGN

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

**TEXT BOOKS:**


- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)
- Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009 (UNIT –IV)
- Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O"Reilly, 2009.(UNIT-V)

**ITO711 INFORMATION SECURITY L3 –T0 –P 0 Credit 3**

**Course Outcomes:** At the end of the course the student will be able to:

| | |
|---|---|
| CO1 | Recognize propensity of errors and remedies in processes involving information technology |
| CO2 | Consummate knowledge of risk and controls in IT operation in industry |
| CO3 | Determine IT security guidelines for various type of industries |
| CO4 | Evaluate asset safeguarding, data integrity, system effectiveness and system efficiency. |
| CO5 | Understand software security auditing including database security audit, network security audit and micro-computer security audit. |

**Mapping of course outcomes with program outcomes**

| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | | 2 | | 3 | | 1 | | 2 | |
| CO2 | | 2 | | 3 | | 1 | | 2 | |
| CO3 | | 2 | | 3 | | 1 | | 2 | |
| CO4 | | 2 | | 3 | | 1 | | 2 | |
| CO5 | | 2 | | 3 | | 1 | | 2 | |

**Detailed syllabus:**

Module1

Computer Auditing- System Access control, Data Access Control, Security Administration, System Design.

Module 2

Hardware Security Controls - The Total System Needs Securing, Levels of Hardware Controls, Operating System Controls , Access Controls, General-Purpose Operating Systems Security , Sources of Additional Information

Module 3

Software Controls - Software Security and Controls, Types of Software Intrusions, Configuration Management , Modularity and Encapsulation, Protecting Information, Selecting Security Software, Analysis of Software Products Database Security - Introduction to Databases, Security Requirements of Databases, Designing Database Security, Methods of Protection,

Security of Multilevel Databases,The Future of Databases. Network and Telecommunication Security - Telecommunications and Networks, Security Considerations, Cases in Point, Special Communications, Security Considerations.

Module 4

Microcomputer Security - Microcomputer Problems and Solutions , The Microcomputer Environment , Security of Microcomputers, Internal Data Security, The Threats to Micros, Developing a Micro Security Plan, Establishing a Micro-to-Mainframe Link , Portable Microcomputer Security , Password Protection, Security of Special Micro Applications.

**Reading:**

1. Deborah Russell, *Computer Security Basics*, O'Reilly & Associate, 1991.
2. Karen A. Forcht, *Computer Security Management*, Boyd & Fraser Publishing Co., 1994.
3. Donald A. Watne, Peter B.B. Turney, *Auditing EDP Systems*, 2nd Edition, PH 1990