Bansilal Ramnath Agarwal Charitable Trust's

**Vishwakarma Institute of Information Technology, Pune-48**

(An Autonomous Institute affiliated to Savitribai Phule Pune University)


# Curriculum for
# S.Y.B.Tech.
# (Information Technology)

# Department of
# Information Technology

# Vision and Mission of the Department

- **Vision**

  "To create professionally competent and globally acceptable IT engineers with social awareness".

- **Mission**

  - Educating budding engineers for **industry, academia, research** and **entrepreneurial** pursuit through rigorous implementation of IT curriculum
  - Inculcating IT skills to develop **innovative solutions** relevant to **global issues**
  - **Imparting values** to practice social and **professional ethics.**

# Program Specific Outcomes (PSOs)

At the end of program, students should be able to

- **PSO a:** An ability to understand, analyze and develop computer programs in the areas related to algorithms, web development and database management
- **PSO b:** An ability to apply knowledge of software engineering principles and practices for multidisciplinary applications to meet the needs of the industry and society

# Program Outcomes (POs)

At the end of program, students should be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, social and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**6. The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

# S.Y.B.Tech.

# 2017 Pattern

# Syllabus Structure

Bansilal Ramnath Agarwal Charitable Trust's

# Vishwakarma Institute of Information Technology, Pune-48

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## Department of Information Technology

### Second Year B. Tech. Information Technology (SYBT) - Semester I (Pattern 2017)

| Course Code | Course | Course Type | Teaching Scheme | | | Examination Scheme | | | | | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Formative Assessment | | | Summative Assessment | | | |
| | | | | | | ISE | | CE | ESE | PR/OR | | |
| | | | L | T | P | T1 | T2 | | | | | |
| ITUA21171 | Discrete Structures & Graph Theory | TH | 4 | - | - | 15 | 15 | 20 | 50 | - | 100 | 4 |
| ITUA21172 | Discrete Structures & Graph Theory- Practice | CE | - | 1 | - | - | - | 50 | - | - | 50 | 1 |
| ITUA21173 | Fundamentals of Data Communication | TH | 3 | 1 | - | 15 | 15 | 20 | 50 | - | 100 | 4 |
| ITUA21174 | Fundamentals of Data Structures* (FDS) | TH | 3 | - | - | 15 | 15 | 20 | 50 | - | 100 | 3 |
| ITUA21175 | Digital Electronics and Logic Design* | TH | 3 | - | - | 15 | 15 | 20 | 50 | - | 100 | 3 |
| ITUA21176 | Problem Solving and Object Oriented programming* | TH | 3 | - | - | 15 | 15 | 20 | 50 | - | 100 | 3 |
| ITUA21177 | Lab Practice – I | CE PR/OR | - | - | 6 | - | - | 50 | - | 50 | 100 | 3 |
| ITUA21178 | Skill Development-I (FDS using C) | CE | - | - | 2 | - | - | 50 | - | - | 50 | 1 |
| ITUA21179 | Environmental Studies | CE | 1 | - | 2 | - | - | 50 | - | - | 50 | 2 |
| A2 | Audit Course | - | - | - | - | - | - | - | - | - | - | - |
| | Total | | **17** | **2** | **10** | **75** | **75** | **300** | **250** | **50** | **750** | **24** |

Lecture: 1Hr. = 1 Credit, Practical: 2 Hrs. = 1 Credit, Tutorial: 1 Hr. = 1 Credit, Audit Course: No Credits

*Courses have lab practice component of 2 hrs./week each under Lab Practice head.

**Audit Courses:** Professional Ethics; Cyber Security; Value Engineering and Human Rights; Legislative Procedures; Technical Writing/Documentation; Sports/Yoga; Performing Art such as music, dance, and drama etc.; Languages; Online certification course (minimum two weeks); Participation in intercollegiate co-curricular and extra-curricular activities.

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# Vishwakarma Institute of Information Technology, Pune-48

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## Department of Information Technology

### Second Year B. Tech. Information Technology (SYBT) - Semester II (Pattern 2017)

| Course Code | Course | Course Type | Teaching Scheme | | | Examination Scheme | | | | | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Formative Assessment | | | Summative Assessment | | | |
| | | | L | T | P | ISE | | CE | ESE | PR/OR | | |
| | | | | | | T1 | T2 | | | | | |
| ITUA22171 | Engineering Mathematics – III | TH | 4 | - | - | 15 | 15 | 20 | 50 | - | 100 | 4 |
| ITUA22172 | Mathematics Practice – III | CE | - | 1 | - | - | - | 50 | - | - | 50 | 1 |
| ITUA22173 | Data Structure and Files* (DSF) | TH | 3 | - | - | 15 | 15 | 20 | 50 | - | 100 | 3 |
| ITUA22174 | Computer Graphics* | TH | 3 | - | - | 15 | 15 | 20 | 50 | - | 100 | 3 |
| ITUA22175 | Computer Organization & Microprocessor* | TH | 3 | - | - | 15 | 15 | 20 | 50 | - | 100 | 3 |
| ITUA22176 | Social Science and Engineering Economics | TH | 3 | - | - | 15 | 15 | 20 | 50 | - | 100 | 3 |
| ITUA22177 | Lab Practice –II | CE PR/OR | - | - | 6 | - | - | 50 | - | 50 | 100 | 3 |
| ITUA22178 | Skill Development-II (DSF using C++) | CE | - | - | 2 | - | - | 50 | - | - | 50 | 1 |
| ITUA22179 | Project Management | CE | 2 | - | - | - | - | 50 | - | - | 50 | 2 |
| A2 | Audit Course | - | - | - | - | - | - | - | - | - | - | - |
| | Total | | **18** | **1** | **8** | **75** | **75** | **300** | **250** | **50** | **750** | **23** |

Lecture: 1Hr. = 1 Credit, Practical: 2 Hrs. = 1 Credit, Tutorial: 1 Hr. = 1 Credit, Audit Course: No Credits

*Courses have lab practice component of 2 hrs./week each under Lab Practice head.

**Audit Courses: Audit Courses:** Professional Ethics; Cyber Security; Value Engineering and Human Rights; Legislative Procedures; Technical Writing/Documentation; Sports/Yoga; Performing Art such as music, dance, and drama etc.; Languages; Online certification course (minimum two weeks); Participation in intercollegiate co-curricular and extra-curricular activities.

# S.Y.B.Tech

# 2017 Pattern

# Syllabus Curriculum

# Semester – I

# Discrete Structures & Graph Theory (ITUA21171)

**Teaching Scheme :**
Credits : 4
Lectures / Week : 4 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Prerequisites :** Basic Algebra

**Course objectives :**

- To study basic of logic and set theory
- To understand notion of functions and relations
- To study basics of graph and trees
- To study fundamental principles of graphs and trees elementary combinatorial processes and probability theory

**Course Outcomes**

After completion of the course, student will be able to

1. Demonstrate use of logical arguments, proof techniques and set theory principles
2. Determine type, properties and solution of relations and functions
3. Solve the problems using graph methods and algorithms
4. Apply tree models and methods to obtain solutions of applications involving searching, prefix code and vertex connectivity
5. Apply principles of counting to obtain solution to counting problems
6. Apply probability theory, principles and distributions in problem

**Unit I - Mathematical Logic and Set Theory**

Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy Sets, Combination of sets, Venn Diagrams, Finite and Infinite sets, Uncountably infinite sets, Principle of inclusion and exclusion, multisets .

**Unit II - Functions and Relations**

Functions, Composition of functions, Invertible functions, Discrete Numeric functions and Generating functions, Job scheduling Problem.

Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence Relations and Partitions, Partial ordering relations and Lattices, Chains and Anti-chains.

Recurrence Relations : Recurrence Relation, Linear Recurrence Relations with constant Coefficients, Homogeneous Solutions, Total solutions, Solutions by the method of generating functions

**Unit III – Graphs**

Basic terminology, Representation of graph in computer memory, Multigraphs and Weighted graphs, Subgraph, Isomorphic graph, Complete ,Regular and Bipartite graphs, Operation on graph, Paths and Circuits, Hamiltonian and Euler paths and circuits, Shortest path in weighted Graph (Dijkstra's algorithm), Factors of a graph, Planar graph and Travelling salesman problem, Graph coloring.

**Unit IV - Trees**

| | |
|---|---|
| Trees, Rooted trees, Path length in rooted trees, Prefix codes and optimal prefix codes, Binary search trees, Tree traversals, Spanning trees, Fundamental circuits and cut set, Minimal spanning trees, Kruskal's and Prim's algorithms for minimum spanning tree, The Max flow –Min cut theorem (transport network). | |
| **Unit V – Counting** | |
| Permutations and Combinations: Rule of sum and product, Pigeonhole principle, Permutations, Combinations, Binomial Coefficients and identities, Algorithms for generation of Permutations and Combinations. | |
| **Unit VI - Discrete Probability** | |
| Discrete Probability, Conditional Probability, Bayes' Theorem, Random variable, Random process, Mean, Mode, Variance, Probability distributions: Binomial trials and Distribution, Binomial probability distribution, Poisson probability distribution, Gaussian probability distribution, | |
| **Text books :** | 1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 6th edition, McGraw-Hill, 2007. ISBN 978-0-07-288008-3.<br>2. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", Second Edition,TataMcGraw-Hill, 2008, ISBN 10:0-07-066913-9. |
| **Reference Books :** | 1. R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education, 2001 ISBN 81 –7808 – 279 – 9.<br>2. B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures", 4th Edition, Pearson Education, 2002, ISBN 81-7808-556-9<br>3. N. Deo, "Graph Theory with application to Engineering and Computer Science", Prentice Hall of India, 1990, 0 – 87692 – 145 – 4<br>4. Eric Gossett, "Discrete Mathematics with proof", 2nd edition, Wiley Student Edition, ISBN: 978-81-265-2758-8 |

# Discrete Structures & Graph Theory-Practice (ITUA21172)

**Teaching Scheme:**
Credits : 1
Tutorial /week: 1 Hr

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : NA

**Companion Course : ITUA21171**

**List of Tutorials**

**Assignment 1 : Mathematical Logic and Set Theory**

1. A survey on sample 25 new cars being sold out at a local auto dealer was conducted to see which of three popular option Air Conditioner (A), Radio (R), Power Windows(W) were already installed. The survey found 15 had Air Conditioners, 12 had Radios, and 11 had Power Windows. 5 had Air Conditioner and Power Windows, 9\ had Air Conditioner and Radio, 4 had Radio and Power Windows. Three had all three options. Find number of cars which had:

(i) only one of the option
(ii) at least one of the option
(iii) none of the options.

Use principle of inclusion exclusion

2.Draw Venn diagram and prove the expression.

3.Prove by induction that for all n > = 1

$$1.2 + 2.3 + \ldots\ldots\ldots\ldots + n(n+1) = \frac{n(n+1)(n+2)}{3}$$

4 Show that $(p \wedge q) \rightarrow (p \rightarrow q)$ is a tautology.

5 Consider the following:

p : This system is good q : This system is cheap

Write each of the following statement in symbolic form.

(i) This system is good and cheap
(ii) This system is not good but cheap
(iii) This system is neither good nor cheap
(iv) This system is good or cheap

6. A survey has been taken on modes of travels. Each respondent was asked to check bus, train or automobile as major modes of travelling for work. More than one answer was permitted. The result, reported outcome were as follows:

Bus-40 people, train-45 people, automobile-100 people, bus and train-20 people, bus and automobile-15 people, train and automobile-20 people and all three modes-5 people. How many people completed a

survey from? Apply principle of inclusion and exclusion.

7.Use mathematical induction to show that:

$$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\cdots\ldots\ldots\ldots+\frac{1}{n(n+1)}=\frac{n}{n+1} \quad \text{for all } n \geq 1$$

8. Define the terms Universal Quantifier and Existential Quantifier.

**Assignment 2 : Functions and Relations**

1. Draw Hasse diagram for any relation. Determine the chains and anti-chains.

2. Let A={1,2,3} and B={a,b,c,d}. In each case state whether the given function (if defined)

is injective, surjective, bijective.

f={(1,a),(2,d),(3,b)} g={(1,a),(2,a),(3,d)}

h={(1,a),(1,b),(2,d),(3,c)} j={(1,a),(2,b)}

3. Find homogeneous solution of a recurrence relation:
$a_n=11a_{n-1} - 39a_{n-2} + 45a_{n-3}$ for $a_0=5$, $a_1=11$, $a_2=25$.

4. Find the transitive closure of R by Warshall's algorithm.
Where A={1,2,3,4,5,6} and R={(x-y);|x-y|=2}

5. Explain with example –i) Equivalence relation ii) Partial ordering relation

6. Consider the following relation on {1, 2, 3, 4, 5, 6}: R= {(i, j) | |i-j|=2 }

Is R transitive? Is R reflexive? Is R symmetric?

**7.** Let f, g, h be the functions from N to N, where N is the set of natural numbers so that

f(n)=n+1, g(n)=2n, h(n)=0 if n is even and h(n)=1 if n is odd. Determine fof, fog, gof, goh, hog, fogoh

8. Let R be the relation on the set A. A={ 5,6,8,10,28,36,48}. Let R={(a,b)| a is a divisor of b}. Draw the Hasse diagram. Compare with diagraph. Determine whether R is equivalence relation.

**Assignment 3 : Graphs**

1.Solving the shortest path by using Dijkstra's algorithm in any graph..

2.Define following terms with suitable examples:

1. Planar Graph
2. Complete Graph

| |
|---|
| 3. Connected and Disconnected Graph |
| 3.Show that in a connected planar graph with 6 vertices and 12 edges, each of the regions is bounded by 3 edges. |
| 4.Explain adjacency matrics and adjacency list with example. |
| 5.Explain term eulerian path and circuit with example. |
| 6. Explain multigraph with example. |
| 7. Define Graph Kn,Kmn. |
| 8. Find whether K6 and K3,3 graphs are isomorphic or not. |
| **Assignment 4 : Trees** |
| 1. Draw binary search tree for input data 200,100,300,50,150,400,10,75,125,175.<br>Which is a root, leaf nodes and interior nodes? |
| 2. For any sets of weights construct an optimal binary Prefix code. |
| 3. 19 lamps are to be connected to single electrical outlet, using extension Chords , each of which has 4 outlets. Find the number of extension chords needed and draw corresponding tree. |
| 4. Find the minimum cost spanning tree of any graph using Prim's algorithm. |
| 5. Find the minimal flow in any transport network using labeling procedure. Determine the corresponding minimum cut |
| 6. Use Kruskal's algorithm to find minimum spanning tree(MST) of any given graph. |
| 7. Draw the unique binary tree when inorder and preorder traversal of tree is given. |
| 8. What is total number of nodes in a full binary tree with 20 leaves? |
| **Assignment 5 : Counting** |
| 1. In how many ways can seven men and seven women sit down at a round table in such a way that no two men sit next to each other? |
| 2. One card is drawn from a pack of cards. Express each of the following probabilities:<br>a. The card is the king of diamonds b. The card is ace<br>c. The card is 9 or 10 d. The card is a spade |
| 3. A bag contains 3 red & 5 black balls & second bag contains 6 red & 4 black balls. A ball is drawn from |

each bag. Find the probability that:

a. Both are red b. Both are black c. 1 is red & 1 is black

4. Find the number of arrangements that can be made out of the letters:

a. ASSASSINATION b. GANESHPURI

5. A pair of dice is thrown. Find the probability that the sum is 10 or greater if:

a. 5 appears on first die. b. 5 appear on at least one die.

6. Show that if 7 colours are used to paint 50 bicycles, atleast 8 bicycles will be the same colour.

7. Suppose repetitions are not permitted

a. How many ways three digits numbers can be formed from six digits 2,3,4,5,7,9 ?

b. How many of these numbers are less than 4000.

8. Explain Pigeonhole Principle.

**Assignment 6 : Discrete Probability**

1. In a certain group of Engineers, 60% have insufficient background of information theory, 50% have inadequate knowledge of probability & 70% in either one or both of the two categories. What is the % of people who know probability among those who have a sufficient background of information theory? Find the mutual information between these two categories.

2. If on an average one candidate out of ten fails in a certain examination, then find the probability that out of 5 candidate that have appeared for examination, at least 4 will be successful.

3. In a bolt factory, there are four machines A, B, C, D manufacturers 20%, 25%, 10% & 45% of the total bolts respectively 2% of the bolts manufactured by A, 4% by B, 2% by C & 5% by D are found to be defective. A bolt is chosen at random and is found to be defective. What is the probability that is manufactured by C?

4. The owner of the restaurant is interested in how much people spend at the restaurant. He examines 10 randomly selected receipts for parties of four and writes down the following data. 44, 50, 38, 96, 42, 47, 40, 39, 46, 50 Find mean, mode and variance.

5. A company makes electric motors. The probability an electric motor is defective is 0.01. What is the probability that a sample of 300 electric motors will contain exactly 5 defective motors?

6. Explain Gaussian Probability Distribution.

7. Explain the terms random variables and random process.

8. In a certain group of Engineers, 60% have insufficient background of information theory, 50% have

inadequate knowledge of probability & 70% in either one or both of the two categories. What is the % of people who know probability among those who have a sufficient background of information theory? Find the mutual information between these two categories.

# Fundamentals of Data Communication ( ITUA21173)

**Teaching Scheme :**
Credits : 4
Lectures / Week: 3Hrs; Tutorial /Week: 1 Hr

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Prerequisites :** Nil

**Course objectives :**

- To understand the concepts of Data Communication.
- To learn the transmission media and its use.
- To study the functions of TCP/IP and OSI layers.

**Course Outcomes:**

After completion of the course, student will be able to

1. Discuss the concepts of Data Communication
2. Describe Modulation and Multiplexing techniques.
3. Describe various transmission media and their use.
4. Discuss the functions of OSI layers, TCP/IP protocol stack and types of network topologies.
5. Describe Error Correction techniques.
6. Describe Multiple Access methods.

**Unit I :Fundamentals of Signals**

Analog and Digital: Analog and Digital Data, Analog and Digital Signals, Periodic and Non-periodic Signal Periodic Analog Signals: Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals Bandwidth
Digital Signals: Bit Rate, bit Length, Digital Signal as a Composite Analog Signal, Transmission of Digital Signals
Transmission Impairment: Attenuation, Distortion, Noise
Data Rate Limits: Noiseless Channel: Nyquist Bit Rate, Noisy Channel: Shannon Capacity, Using Both Limits
Performance: Bandwidth, Throughput, Latency (delay), Bandwidth-delay Product, Jitter

**Unit II :Modulation and Multiplexing Techniques**

Digital-to-digital Conversion: Line Coding, Line Coding Schemes, Block Coding, Scrambling Analog to digital Conversion: Pulse Code Modulation (PCM), Delta Modulation (DM), ADM Transmission modes: parallel transmission, serial transmission Analog-to-analog Conversion: Amplitude Modulation, Frequency Modulation, Phase Modulation Multiplexing: Frequency-Division Multiplexing (FDM), Wavelength-Division Multiplexing Synchronous Time-Division Multiplexing, Statistical Time-Division Multiplexing Spread Spectrum: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum.

**Unit III: Transmission Media and Switching**

Guided Media: Twisted-Pair, Coaxial and Fiber-Optic Cable Unguided Media: Radio Waves, Microwaves, Infrared IEEE standard and connectors for media. (RJ45, RJ11, BNC, SC/ST etc.) Circuit-switched Networks: Three Phases, Efficiency, Delay, Packet switching : Datagram networks, Virtual circuit networks
Brief introduction of Digital Subscriber Line: ADSL, HDSL, SDSL, VDSL (DMT), Cable modem.

**Unit IV: Layer Model and Topologies**

The OSI Model: Layered Architecture, peer-to-peer Processes, Encapsulation of Layers in the OSI Model, TCP/IP Protocol Suite, LAN, MAN, WAN, Topologies like star, mesh, bus, hybrid etc. Addressing: Physical &logical Addresses, Port Addresses, Specific Addresses Connecting devices: hubs, repeaters, active hubs, bridges, layer two switches, Routers, layer three switches, gateway Backbone networks: bus backbone, star backbone

| **Unit V :Error Control and Data Link Control** | |
|---|---|
| Types of errors: Redundancy, detection versus correction, forward error correction versus retransmission Block coding: error detection, error correction, CRC, polynomial, checksum, hamming code, hamming distance DLC Services: Framing, Flow and error control DLL Protocols : Simple protocol, Stop n wait, Go back to N, Selective repeat HDLC Protocol: configurations and transfer modes, frames, control field. Point-to-point Protocol (PPP) : Framing, Transition Phases, Multiplexing, Multilink PPP | |
| **Unit VI: Multiple Access and Ethernet** | |
| Random access: Aloha, Slotted Aloha, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA). Controlled access: reservation, polling, token passing. Channelization: Frequency Division Multiple Access (FDMA), Time-Division Multiple Access (TDMA), Code Division Multiple Access (CDMA). Ethernet: IEEE standards, data link layer, physical layer. Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10 gigabit Ethernet. | |
| **Text books :** | 1.Fourauzan B., "Data Communications and Networking", 5th edition, McGraw-Hill Publications<br>2. Stallings William., "Data and Computer Communications", Sixth Edition, Prentice Hall of India |
| **Reference Books:** | 1.Andrew S. Tenenbaum ,"Computer Networks", Pearson<br>2. Douglas E. Comer, "Computer Networks and Internets", Pearson Education |

| **Tutorial List:** | |
|---|---|
| 1 | Represent the fallowing signal.<br>A. Draw two input analog signals and prepare composite signal as an output in time domain.<br>B. Draw three input analog signals and prepare composite signal as an output in time domain. |
| 2 | Represent the fallowing signal.<br>A. Draw two input analog signals and prepare composite signal as an output in frequency domain.<br>B. Draw three input analog signals and prepare composite signal as an output in frequency domain. |
| 3 | For a sine wave (with given offset value) calculate phase in degrees and radians? |
| 4 | Draw the signal starts with different phase (Any four) |
| 5 | Calculate signal levels required for given cases. |
| 6 | Calculate maximum bit rate for a noiseless channel by Nyquist theorem. |
| 7 | Calculate the signal rate for different cases. |
| 8 | How many extra bits per second does the sender send if sender and receiver clock works at different speed. |
| 9 | A. Study of any one Network tool. (Ex. Cisco packet tracer)<br>B. Installation and Demonstration of the tool. |
| 10 | Visit one laboratory and study all the network components and design used their, prepare report on it |

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| | (Group wise lab will be assigned). |

# Fundamentals of Data Structures ( ITUA21174)

**Teaching Scheme:**
Credits : 3
Lectures / Week: 3 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Pre-requisites:** Fundamentals of Programming Languages

**Course objectives:**

- To understand the different ways of data representation
- To define high level of abstraction of linear data structure and algorithm.
- To develop the ability to synthesize and analyze algorithms
- To study the representation, implementation and applications of linear data structures

**Course Outcomes:**

After completion of the course, student will be able to

1. Apply appropriate constructs of C language including pointers and file handling, and use coding standards for application development.
2. Use algorithmic foundations and perform basic analysis of algorithms with respect to time and space complexity.
3. Select appropriate searching and/or sorting techniques in the application development.
4. Represent, implement and apply various linear data structures using sequential organization for problem solving and programming.
5. Represent, implement and apply various linear data structures using linked organization for problem solving and programming.
6. Represent, implement and apply advanced linear data structures stack and queue for problem solving and programming.

**Unit I :Pointers in C and File Handling**

Introduction to Pointers, Dynamic memory allocation, Pointer to pointer, Pointer to single and multidimensional arrays, Array of pointers, String and structure manipulation using pointers, Pointer to functions. Pointer to file structure and basic operations on file, File handling in C.

**Unit II : Introduction to Data Structures and Analysis of Algorithms**

Concept of data, Data object, Data structure, Abstract Data Types (ADT), Concept of primitive and non-primitive, Linear and non-linear, Static and dynamic, Persistent and ephemeral data structures. Use of data structures in coding, **Analysis of algorithm:** frequency count and its importance in analysis of an algorithm, Time complexity & Space complexity of an algorithm, Big 'O', 'Ω' and 'Θ' notations, Best, Worst and Average case analysis of an algorithm.

**Unit III :Searching and Sorting Techniques**

Need of searching and sorting, Linear & Binary search, Bubble sort & complexity Analysis, Selection sort & complexity analysis, Insertion Sort & Complexity Analysis, Merge Sort & complexity Analysis, Quick Sort & complexity Analysis..

**Unit IV: Linear Data Structures using sequential Organization**

Concept of Linear data structures and sequential organization, Concept of ordered list, Multidimensional arrays and their storage representation: row major and column major form and address calculation .Representation of sparse matrix using arrays, algorithms for sparse matrix addition, simple and fast transpose, polynomial representation using arrays .Analysis of these algorithms

| | |
|---|---|
| **Unit V: Linear Data Structures using Linked Lists** | |
| Concept of linked organization, Singly linked list, Doubly linked list, Circular linked list. Linked list as an ADT. Representation and manipulations of polynomials using linked lists, Comparison of a sequential and linked memory organization, Concept of Generalized Linked List, Representation polynomial using GLL. | |
| **Unit VI : Linear Data Structures-Stack and Queue** | |
| Stacks: Concept of stack, Push and pop operation, Stack implementation using array and linked list, Application of stack for expression conversion and evaluation, Recursion concept and use of internal stack. Concept of queue & its application, Priority queue concepts and operations, Doubly ended queue concepts and operations, Circular queue concepts and operations, Multi-stack and Multi-queue concepts. | |
| **Text books :** | 1.R. Gilberg, B. Forouzan, "Data Structures: A pseudo code approach with C", Cenage Learning, ISBN 9788131503140.<br>2. E. Horowitz , S. Sahani, S. Anderson-Freed, "Fundamentals of Data Structures in C", |
| **Reference Books :** | 1. A. Aho, J. Hopcroft, J. Ulman, "Data Structures and Algorithms", Pearson Education, 1998, ISBN-0-201-43578-0<br>2. Y. Langsam, M. Augenstin and A. Tannenbaum, "Data Structures using C and C++", 2nd Edition, Prentice Hall of India, 2002, ISBN-81-203 -1177-9<br>3. J. Tremblay, P. Soresan, "An introduction to data structures with Applications", 2nd edition, Tata McGraw-Hill International Editions, 1984, ISBN-0-07-462471-7. |

# Digital Electronics and Logic Design (ITUA21175)

**Teaching Scheme:**
Credits : 3
Lectures / Week: 3 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Pre-requisites:** Basic Electronics Engineering

**Course objectives:**

- To understand principles, characteristics and operations of combinational & sequential logic circuits.
- To design combinational circuits by using logic gates, MSI circuits, PLDs.
- To explain Boolean algebra and the various methods of Boolean function reduction.
- To design, implement and analyze, asynchronous and synchronous sequential Circuits (FSM) using flip flops.

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

1. Understand and apply Boolean laws/K-Map method to reduce a given Boolean function.
2. Design & realize combinational logic circuits using logic gates, MSI circuits, PLDs for various Practical applications.
3. Demonstrate the operation of flip flops, counters and shift registers.
4. Design Synchronous sequential machine using Moore and Mealy machine.
5. Distinguish between various memories and Implementation of digital circuits using PLA.
6. Demonstrate logical skills, debugging skills in designing

**Unit I : Number Systems and Logic Gates**

Logic Gates, Symbols, and Truth tables: AND, OR, NAND, NOR, NAND gates, Implementation of simple Boolean equation: Truth Table, K-Map. Introduction to Number Systems: Binary, Hexadecimal numbers, Octal numbers and number conversion, Signed Binary number representation. Signed Magnitude, 1's complement and 2's complement representation, Binary, Hexadecimal Arithmetic, 2's complement arithmetic, Codes: BCD, Excess-3, Gray code, Binary Code and their conversion, DeMorgan's rules Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra.

**Unit II :Combinational Logic Circuits**

Half- Adder, Full Adder, Half Subtractor, Full Subtractor, n bit Binary Adder, Code converters (binary to gray & Gray to binary, BCD to Excess 3 and vice versa), Multiplexer and Demultiplexer (74153/74151/74138), Encoder, Decoder, Adder with look ahead carry generator, Parity generator and checker using 74180, Parallel adder (IC 7483), Subtractor using adder IC 7483, Boolean optimization, K-map optimization.

**Unit III: Sequential Logic Circuits**

Introduction: Sequential Circuits, Difference between combinational circuits and sequential Circuits, 1 Bit Memory Cell, Latches (SR, JK, D and T), Clocked latches (SR, JK, D and T), Flip Flop (JK, T and D). Designing FF using latches, Use of preset and clear terminals, Excitation Table & TT for flip flops, and Conversion of flip flops, Study of 7476, Timing parameters of FF Application of Flip flops: Registers, Shift registers, Universal Shift Registers, Counters : Asynchronous counter, Synchronous counter, Ring counters, BCD Counter, Johnson Counter, Modulo- n counter(IC 7490, 74191), Pseudo Random Binary Counter.

**Unit IV: Algorithmic State Machines**

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| Algorithmic State Machines, ASM charts, Notations, Design of simple controller, Multiplexer controller method Examples, Sequence Generator, Types of Counter Programmable Logic Devices PLD: PLA- Input, Output Buffers, AND, OR, Invert/ Non-Invert Matrix, Design Example- Any 4 Variables SOP function using PLDs Study of basic architecture of FPGA and CPLD. | |
| **Unit V :VHDL Programming** | |
| Introduction to HDL, VHDL- Library, Entity, Architecture, Modeling Styles: Dataflow, Behavioral , and Structural, Concurrent and Sequential Statements, Data Objects (Variable, signal & constant) & Data Types (scalar, composite array type & predefined data types, Attributes (necessity and use), Event attribute, VHDL program for Combinational Circuits-Adder, MUX, VHDL for program Sequential Circuits-Synchronous and Asynchronous Counter, Shift Register. | |
| **Unit VI: Introduction to Microprocessor and Microcontrollers** | |
| Introduction of Microprocessor and Microcontroller, Difference between Microprocessor and Microcontrollers with their applications, Difference between Von Neumann and Harvard Architecture, Intel x86 Architecture (Ex: 8086), Data Bus, Address Bus, Control Bus, 8086 Programmers model as an example and programming with 8086, Evolution of Microcontroller (8/16/32 bit). | |
| **Text books:** | 1. R. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw-Hill, 2003, ISBN 0– 07 – 049492 – 4.<br>2. Stephen Brown, Zvonko Vranesic " Fundamentals of Digital Logic with VHDL Design" Mcgraw-Hill |
| **Reference Books:** | 1. John Yarbrough, "Digital Logic applications and Design"<br>2. Thomson Flyod "Digital Principles", Pearson Education<br>3. Malvino, D.Leach " Digital Principles and Applications", 5th edition, Tat Mc-Graw Hill<br>4. J.Bhaskar "VHDL Primer" 3rd Edition, Pearson Edition |

# Problem Solving and Object Oriented programming ( ITUA21176)

**Teaching Scheme:**
Credits : 3
Lectures / Week: 3 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Pre-requisites:** Fundamentals of Programming Languages

**Course Objectives :**

- Employ a problem-solving strategy to breakdown a complex problem into a series of simpler tasks.
- Execute problem-solving actions appropriate to completing a variety of sub problems.
- Apply analytical and logical thinking to extract facts from a problem description and determine how they relate to one another and to the problems to be solved.
- Design and implement an object oriented solution to solve a real life problem.
- Develop problem-solving and programming skills using OOP concept.

**Course Outcomes:**

After completion of the course, student will be able to

1. Understand problem solving and programming concept
2. Understand logic structure and develop algorithms for solving problems by using modular programming concepts
3. Understand basic of object oriented programming and develop basic structure of object oriented program.
4. Understand and apply overloading and inheritance concepts.
5. Understand and apply the polymorphism and generic programming in problem solving.
6. Use exception and file handing concepts in problem solving.

**Unit I :Problem Solving Concepts**

General Problem Solving Concepts-Types of problems, problems solving with computers, Problem Solving Aspects, Problem Solving Concepts for computer- Constants and variables, Data types, Functions, Operators, Expressions and equations, Programming Concepts – Communicating with computers, Organizing the problem using the tools, Testing the solution, Coding the program, Top down design.

**Unit II :Problem Solving with Logic Structures**

Programming Structure - Modules and their functions, Cohesion & coupling, Local and global variable, Parameters, Return values, Variable names and data dictionaries, Four logic structures. Problem solving with sequential logic structure - The sequential logic structure, Solution development. Problem Solving with Decisions – Decision logic structure, Multiple if/then/else instructions, Straight-through logic, Positive logic, Negative logic, Logic conversion, Decision tables. Problem solving with loops and Case logic structures

**Unit III: Foundations of Object Oriented Programming**

Introduction: Introduction to procedural, Modular, Object-oriented and Generic programming techniques, Limitations of procedural programming, Need of object-oriented programming, Fundamentals of object-oriented programming: Objects, Classes, Data members, Methods, Messages, Data encapsulation, Data abstraction and Information hiding, Inheritance, Polymorphism

++ Extensions to C : Variable declarations, Global scope, 'const',Reference variables, Operators in C++(scope resolution, new , delete), Dynamic memory allocation, Function prototypes, Default and constant arguments, 'cin', 'cout', Inline functions **Class**: Defining a class, Data members and member functions, Public, Private and Protected members, Inline member functions, Static data members, Static member functions, Constructors, Destructors, Array of objects, Classes, Objects and Memory, Class as ADTs and Code reuse

**Unit IV: Overloading and Inheritance**

Function overloading, Friend function, Friend class Operator Overloading : Introduction, Need of operator overloading, Rules for operator overloading, Overloading the unary and binary operators using member function, Operator overloading using friend function, Overloading new, delete and assignment operator, Type conversions Inheritance : Introduction, Need of inheritance, Base and derived classes, Member access control, Types of inheritance, Derived class constructor, Constructors in multiple inheritance, Overriding member functions, Ambiguity in multiple inheritance, Virtual base class

**Unit V :Virtual Functions and Templates**

Virtual functions : Pointers to objects, 'this' pointer, Pointers to derived class, Virtual function, Rules for virtual function, Pure virtual function, abstract class, Virtual destructors, Early and late binding, Container classes Templates : Introduction, Function template and class template, Overloading function template, Member function templates and template arguments, Introduction to Standard Template Library (STL), Containers, Iterators and Algorithms

**Unit VI: Exception Handling and File I/O**

Namespaces: Introduction, Rules of namespaces Exception Handling: Introduction, Exception handling mechanism: Try, Catch and Throw, Multiple Exceptions, Exceptions with arguments File I/O: Introduction, Classes for file stream operations, File operations (open, close, read, write, detect end of file), File modes, File pointers and their manipulations, Error handling during file operations

**Text books :**

1. R G Dromey, "How to Solve it by Computer", Pearson Education, 2008, ISBN-13: 978-8131705629.
2. Maureen Spankle, "Problem Solving and Programming Concepts", Pearson, 2011, ISBN-13**:** 978-0132492645.
3. Robert Lafore, "Object-Oriented Programming in C++", SAMS Techmedia

**Reference Books :**

1. Joyce Farrell, "Programming Logic and Design", Cengage Learning, ISBN-13: 978-1285776712.
2. E. Balaguruswamy, "Object-oriented Programming with C++", Tata McGraw Hill, 5th edition.
3. Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.
4. Shukla, "Object-Oriented Programming in C++, w/cd", Wiley, ISBN-9788126516582.
5. Kogent, "Object Oriented Programming Methodology", Wiley, ISBN-9789351191841.
6. Venugopal, "Mastering C++", McGraw-Hill, ISBN-9781259029943

# Lab Practice -I ( ITUA21177)

**Teaching Scheme :**
Credits : 3
Practicals / Week: 6 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Course objectives :**

- To understand different linear data structures.
- To understand different searching/ sorting algorithms.
- To learn and understand the basic digital design techniques, and construction of Combinational and Sequential circuits.
- To introduce VHDL programming.
- Employ a problem-solving strategy to breakdown a complex problem into a series of simpler tasks.
- Design and implement an object oriented solution to solve a real life problem.

**Course Outcomes:**

After completion of the course, student will be able to

1. Apply appropriate constructs of C language including pointers and file handling, and use coding standards for application development.
2. Represent, select, implement and apply various linear data structures for problem solving and programming.
3. Solve K-maps and apply Boolean Algebra.
4. Identify the digital circuits, I/O to replace by FPGA.
5. Develop and implement algorithms for solving simple problems using modular programming concept
6. Discover, explore and apply tools and best practices in object-oriented programming.

**PART I- Programming Laboratory**

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| 1 | a) Perform matrix operations without pointers. |
| | b) Perform matrix operations with pointers. |
| 2 | a) Create database for employees of an organization using sequential file and perform following operations: i. Display ii. Add records |
| | b) Perform following operations on employee database<br>iii. Search record iv. Modify record v. Delete record |
| 3 | a) Sort the set of strings in ascending order using Bubble sort and descending order by using Selection sort or Insertion sort. (Display pass by pass output) |
| | b) Search a particular string using binary search with and without recursion. |
| 4 | a) Implement Quick Sort / Merge Sort to sort the given list of numbers. Display corresponding list in each pass. (**with recursion**) |
| | b) Implement Quick Sort / Merge Sort to sort the given list of numbers. Display corresponding list in each pass. (**without recursion**) |
| 5 | a) Implement polynomial using CLL and perform i. Addition of Polynomials |
| | b) Implement polynomial using CLL and perform<br>ii. Multiplication of polynomials and iii. Evaluation of polynomial |
| 6 | a) Implement stack ADT using linked list.<br>Write a program for Expression Evaluation using stack. |
| | b) Write a program for Expression Conversion using stack. |

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| | ***All assignments to be implemented using C on Linux platform.** |
| | **PART II-Digital Laboratory** |
| 1 | a. Design (truth table, K-map) and implementation of 4-bit Binary to Gray Code converters. |
| | b. Design (truth table, K-map) and implementation of 4-bit BCD to Excess-3 Code converters. |
| 2 | a. Design (truth table, K-map) and implementation of 4 bit BCD Adder using IC7483. |
| | b. Design (truth table, K-map) and implementation of 4 bit Excess 3 Adder using IC7483. |
| 3 | Implementation of logic functions using multiplexer IC 74153. (Verification, cascading & logic function implementation) . |
| 4 | Design (State diagram, state table & K map) and implementation of 3 bit Up and Down Asynchronous Counter using master slave JK flip-flop IC 7476. |
| 5 | a. Design (State diagram, state table & K map) and implementation of 3 bit Up Synchronous Counter using master slave JK flip-flop IC 7476. |
| | b. Design (State diagram, state table & K map) and implementation of 3 bit Down Synchronous Counter using master slave JK flip-flop IC 7476 |
| 6 | a. Design and implementation of Modulo 'n' counter with IC7490. |
| | b. Design and implementation of Module 'n' counter with IC 74191. |
| 7 | Write a program in VHDL for 4:1 multiplexer using data flow & structural modeling. |
| 8 | Write a program in VHDL for full adder using behavioral & structural modeling. |
| | **PART-III Object oriented programming laboratory** |
| 1 | Create a class named weather report that holds a daily weather report with data members day_of_month, hightemp, lowtemp,a mount_rain and amount_snow. Use different types of constructors to initialize the objects. Also include a function that prompts the user and sets values for each field so that you can override the default values. Write a menu driven program in C++ with options to enter data and generate monthly report that displays average of each attribute. |
| 2 | a. Design a class 'Complex 'with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading. Addition and subtraction using friend functions<br><br>b. Design a class 'Complex 'with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading. Multiplication and division using member functions |

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| 3 | Design a base class with name, date of birth, blood group and another base class consisting of the data members such as height and weight. Design one more base class consisting of the insurance policy number and contact address. The derived class contains the data members' telephone numbers and driving license number.<br><br>a. Write a menu driven program to carry out the following operations:<br><br>i. Build a master table ii. Display iii. Insert a new entry<br><br>b .Write a menu driven program to carry out the following operations:<br><br>i. Delete entry ii. Edit iii. Search for a record |
| 4 | Create a base class shape with two double type values and member functions to input the data and compute_area() for calculating area of figure. Derive two classes' triangle and rectangle. Make compute_area() as a virtual function and redefine this function in the derived class to suit their requirements. Write a program that accepts dimensions of triangle/rectangle and display calculated area. |
| 5 | Write a program in C++ which includes the code for following operations :i. A function to read two double type numbers from keyboard<br><br>ii. A function to calculate the division of these two numbers<br>iii. A try block to detect and throw an exception if the condition "divide-by-zero" occurs<br>iv. Appropriate catch block to handle the exceptions thrown |
| 6 | Write a program in C++ using function/class template to read two matrices of different data types such as integers and floating point values and perform simple arithmetic operations on these matrices separately and display it. |
| 7 | a. Write a program in C++ to implement sequential file for students' database and perform following operations on it i. Create Database ii. Display Database iii. Add a record<br><br>b. Write a program in C++ to implement sequential file for students' database and perform following operations on it i. Delete a record ii. Modify a record |

# Skill Development-I (FDS using C) (ITUA21178)

**Teaching Scheme:**
Credits : 1
Practicals / Week: 2 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : NA

**Course objectives:**

- To apply appropriate coding knowledge and coding practices for application development.
- To select and use appropriate data structures and algorithms for any given application.

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

1. To develop and apply learnt programming skills for solving applications.

**List of Assignments:**

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| 1 | a) In a class of 60 students, 40 students like math, 36 like science, 24 like both the subjects. Find the number of students who like (i) Math only i.e. n (M) - n(MnS), |
| | b) Find the number of students who like (ii) Science only i.e. n(S) - n(MnS),(iii) Either Math or Science n(MuS) . |
| 2 | a) Create a database for inventory system of a shop using array of structures and perform following operations on it: i. Add record ii. Display Database |
| | b) In the inventory system database iii. Search record iv. Delete record v. Sort records |
| 3 | a) Accept conventional matrix and convert it into sparse matrix using structure and Perform **addition** of two sparse matrices. |
| | b) Implement simple and fast transpose algorithms on sparse matrix. |
| 4 | a) Implement a singly linked list(SLL) with following options i. Insertion of a node at any location ii. display a list |
| | b) For SLL perform ii. Deletion of a node from any location iv. Display in reverse |
| 5 | a)Implement any database using doubly linked list with following options i. Insert a record ii. Display list forward iii. Display list backward |
| | b) i. Modify a record ii. Delete a record |
| 6 | GLL implementation for book index. |
| 7 | Implement a priority Queue for a list of patients using linked list. |
| | ***All assignments to be implemented using C/C++ on Linux platform.** |

# Environmental Studies ( ITUA21179)

**Teaching Scheme :**
Credits: 2
Lectures/Week: 1 Hr; Practicals/Week: 2 Hrs/week

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : NA

**Prerequisites :** Basic understanding of Biology and Chemistry

**Course Objectives:**

- To explain the importance of the environment, its components, and inter-relationship between man and environment.
- To demonstrate the importance of ecosystem, biodiversity and natural bio geo chemical cycle.
- To elucidate different types of environmental pollution and control measures.

**Course Outcomes:**

At the end of the course the students will have an ability to

1. Understand and realize the multi-disciplinary nature of the environment, its components, and inter-relationship between man and environment.
2. Comprehend the importance of ecosystem, biodiversity and natural bio geo chemical cycle.
3. Identify different types of environmental pollution and control measures.

**Unit I : Environment and Natural Systems**

Definition and Components of Environment, Relationship between the different components of Environment, Man and Environment relationship, Impact of technology on Environment, Environmental Degradation, and Multidisciplinary nature of the Environment studies, its scope and importance in the present day Education System. Ecology and Ecosystems: Introduction: Ecology- Objectives and Classification , Concept of an ecosystem- structure and functions of ecosystem Components of ecosystem- Producers, Consumers, Decomposers Bio-Geo- Chemical Cycles- Hydrologic Cycle, Carbon cycle, Food Chains, Food webs ,Ecological Pyramids. Case Study :- Forest Ecosystem, Aquatic Ecosystem, Desert Ecosystem.

**Unit II: Human Population and Environmental Pollution**

Population Growth, World and Indian scenario, Population and Environmental Degradation,
Urbanization: Urban population growth and Environmental problems Types of Environmental Pollution: Water Pollution**:** Introduction – Water Quality Standards, Sources of Water Pollution: Industrial , Agricultural, Municipal; Classification of water pollutants, Effects of water pollutants, Air Pollution**:** Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO2, Effects of common air pollutants Land Pollution**:** Land uses ,Land degradation: causes, effects and control, soil erosion, Noise Pollution**:** Introduction, Sound and Noise, Noise measurements, Causes and Effects, Role of individual in the prevention of pollution. Case Study for each type of environmental pollution

**Unit III: - E-waste Management and Global Environmental Issues**

Electronic Waste: Definition, Amount of electronic waste worldwide, Global trade issues, Environmental

impact, Information security, E-waste management, Recycling : Consumer awareness efforts, Processing techniques, Benefits of recycling, Electronic waste substances : Hazardous and Generally non-hazardous.

Global Environmental Issues: Climate Change, Global Warming and Green House Effect, Acid Rain, Depletion of Ozone layer.

**Text books:** 1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Second edition, 2013 Publisher: Universities Press (India) Private Ltd, Hyderabad.

2. Basics of Environmental Studies by Prof Dr N S Varandani ,2013 Publisher: LAP -Lambert Academic Publishing , Germany

**Reference books:**

1. Environmental Studies by Anindita Basak ,2009 Publisher: Drling Kindersley(India)Pvt. Ltd Pearson

2. Textbook of Environmental Studies by Deeksha Dave & S S Kateva , Cengage Publishers.
3. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons.
4. Environmental Studies by R. Rajagopalan, Oxford University Press
5. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by : S K Kataria & Sons New Delhi
6. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill

**Practical Assignments :**

1. Create and demonstrate simulation model for Forest ecosystem.
2. Create and demonstrate simulation model Aquatic ecosystems
3. Create and demonstrate simulation model Desert Ecosystems
4. Create presentation for the study of causes, effects and prevention of Water Pollution.
5. Create presentation for the study of causes, effects and prevention of Air Pollution.
6. Create presentation for the study of causes, effects and prevention of Land Pollution.
7. Determine noise pollution by measuring sound using simulation tools.
8. Design and present chart explaining e-waste management.
9. Classification of electronic devices into hazardous and nonhazardous devices
10. Study of recycling using various online videos

# Semester - II

# Engineering Mathematics-III (ITUA22171)

**Teaching Scheme :**
Credits : 4
Lectures / Week: 4 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Pre-requisites:** Basics of Derivatives, Integration, Trigonometry, Vector algebra & complex number

**Course objectives :**

- To develop the ability, to know the concepts of Engineering Mathematics and to apply these to solve engineering problems in various fields.
- The Tutorial sessions and assignments will help the students to practice more problems on all the topics mentioned in the course contents.

**Course Outcomes :**

After successful completion of the course, student will be able to

1. Apply the knowledge of linear differential equations related to simple electrical circuits.
2. Design and analysis of continuous and discrete system, where knowledge of Fourier Transform and Z Transform is required.
3. Apply advanced techniques to evaluate integrals of higher level.
4. Demonstrate and understand the nature of curves like Cardioide, Astroid, Lemniscate, and Rose Curve by tracing the same using certain properties. and measure arc lengths of various curves.
5. Apply knowledge of solid geometry in Various field of Engineering
6. Evaluate Double & triple integral & Apply knowledge of multiple integrals to find Area, Volume.

**Unit I : Linear Differential Equations**

Linear Differential Equations (LDE) Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits

**Unit II :Transforms**

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform Fourier Sine and Cosine Transform and their Inverses, Application to Wave Equation.
Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

**Unit III: Statistics and Probability**

Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis, Least Square approximation and Fitting of Linear and Quadratic curves. Correlation and Regression, Reliability of Regression Estimates, Theorems and Properties of Probability, Probability Distributions: Binomial, Poisson, Normal and Hyper geometric Distribution.

**Unit IV: Computer Oriented Numerical Methods**

Solution of Simultaneous equations by Gauss Jacobi method, Gauss Seidel method,
Roots of algebraic and Transcendental equations by Bisection method, Newton -Raphson method, Regula Falsi Method. Solutions of Differential equations by Euler method, Euler modified method, Runge kutta $4^{th}$ order method.

| **Unit V :** | **Vector differential and Integral Calculus Calculus** | |
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| Vector Differential Calculus: Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoid, Irrotational and Conservative Fields, Scalar Potential, Vector Identities. Vector integration: Line integral, Greens Theorem, Definitions of Gauss divergence Theorem and Stokes theorem. | | |
| **Unit VI:** | **Complex Variables.** | |
| Complex Variables Functions of Complex Variables, Analytic Functions,C-R Equations, Conformal Mapping, Bilinear ,Transformation, Cauchy's Theorem, Cauchy's Integral formula, Laurent's Series, Residue Theorem | | |
| **Text books :** | | |
| 1. Higher Engineering Mathematics Dr. B. S. Grewal, Khanna Publications<br>2. Applied Engineering Mathematics by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan. | | |
| **Reference Books :** | | |
| 1. Advanced Engineering Mathematics By Erwin Kreyszig, Wiley Publications.<br>2. Advanced Engineering Mathematics By O'Neil, Cengage India. | | |

# Mathematics Practice -III (ITUA22172)

**Teaching Scheme :**

Credits : 1
Tutorials / Week: 1 Hr

**Examination Scheme**

Formative Assessment : 50
Summative Assessment : NA

**Course objectives:**

- To develop the ability, to know the concepts of Engineering Mathematics and to apply these to solve engineering problems in various fields.
- The Tutorial sessions and assignments will help the students to practice more problems on all the topics mentioned in the course contents.

**Course Outcomes:**

After completion of the course, student will be able to

1. To introduce higher order linear differential equations and Modeling of problems on bending of beams, whirling of shaft and mass spring system.
2. To introduce Fourier Transform and Z Transform for Continuous and discrete time domain signals.
3. To know Statistical technique to analyse the data.
4. To introduce Numerical methods for Algorithms and programming.
5. To introduce vector differentiation and vector Integration.
6. To introduce Complex Variables and to study Analytic functions.

**1. Linear Differential Equations**

Problems on Differential Equations by Integration method and Shortcut methods

**2. Linear Differential Equations**

Problems on Differential Equations by method of variations of parameter and Cauchy/Legendre Equations

**3. Fourier and Z Transform**

Problems on Fourier Transform

**4. Fourier and Z Transform**

Problems on Z Transform and Inverse Z Transform

**5. Statistics and Probability**

Problems on Moments, correlation, fitting of curves.

**6. Statistics and Probability**

Problems on Probability distributions and basic Probability.

**7. Computer oriented Numerical methods**

Problems on Newton Raphson method for roots of equations, Solutions of Differential equations using Runge Kutta fourth order method.

**8. Vector differential Calculus**

Problems on Gradient, divergence, Curl and Vector Identity.

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| **9. Vector Integral Calculus** |
| Problems on Line integral, surface integral, volume integral. |
| **10. Complex variables** |
| Problems on Analytic functions, Cauchy integral formula and bilinear transformations. |
| **Text Books** |
| 1. Higher Engineering Mathematics Dr. B. S. Grewal, Khanna Publications<br>2. Applied Engineering Mathematics by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan. |
| **Reference books:** |
| 1. Advanced Engineering Mathematics By Erwin Kreyszig, Wiley Publications.<br>2. Advanced Engineering Mathematics By O'Neil, Cengage India. |

# Data Structure and Files (ITUA22173)

**Teaching Scheme :**
Credits : 3
Lectures / Week: 3 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Pre-requisites:** Basics of Programming Languages, Fundamentals of Data Structures, Object oriented programming

**Course objectives:**

- To study data structures and their implementations using OOP (C++) and applications.
- To study some advanced data structures such as trees, graphs, tables.
- To study the representation, implementation and applications of data structures.
- To choose the appropriate data structure for modeling a given problem.
- To learn different file organizations.

**Course Outcomes:**

After completion of the course, student will be able to

1. Represent, select, implement and apply tree data structures for problem solving and programming.
2. Represent, select, implement and apply graph data structures for problem solving and programming.
3. Represent, select, implement and apply symbol table data structures for problem solving and programming.
4. Understand heap ADT and its implementations.
5. Understand different multi way trees.
6. Understand and implement various file organization techniques.

**Unit I : Trees**

Difference in linear and non-linear data structure, Basic tree concepts, Binary trees and their properties, Representation using sequential and linked organization, Full and complete binary trees, Conversion of general tree to binary tree, Binary tree as an ADT. Recursive and non-recursive algorithms for binary tree traversals, Binary search trees, and Binary search tree as ADT, Concept of threaded binary tree, Insertion and deletion of nodes in in-order threaded binary search tree, Preorder, in-order traversals of in-order threaded binary tree, Applications of binary trees: Gaming, Expression and Decision trees.

**Unit II : Graphs**

Graph as an ADT, Representation of graphs using adjacency matrix and adjacency list, Depth First Search and Breadth First Search traversal. Prim's and Kruskal's algorithms for minimum spanning tree, Shortest path using Dijkstra's algorithm, Topological sorting, Applications of Graphs.

**Unit III: Symbol Tables**

**Symbol Table :**Notion of Symbol Table, Static & dynamic tree table, Concept of OBST , AVL Trees and algorithms **Hash tables and scattered tables:** Basic concepts, Hash function, Characteristics of good hash function, Different key-to-address transformations techniques, Synonyms or collisions, Collision resolution techniques- linear probing, Quadratic probing, Rehashing, Chaining without replacement and Chaining with replacement, Applications.

**Unit IV: Heaps**

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|---|---|
| Heap: Heap definition, Heap properties, Types of heap , Heap data structure, Applications of heap: heap sort implementation , Priority queue, Huffman algorithm | |
| **Unit V : Multi way trees** | |
| Basic of m-way search tree, Concept of red and black trees , B tree implementation, Concept of B+ -tree, *K*-d B-trees , Splay trees , R-Trees , Quad tree, Applications. | |
| **Unit VI: File Organization** | |
| External storage devices, file organization - Sequential file organization, Direct file organization, Index sequential file organization, their implementation and comparison, Multi-indexed Files, Inverted Files, Hashed Files | |
| **Text books :** | 1. Horowitz and Sahani, ―Fundamentals of Data Structures in C++‖, University Press, ISBN 10: 0716782928 ISBN 13: 9780716782926.<br>2. R. Gillberg, B. Forouzn, ―Data Structures: A Pseudo code approach with C++‖, Cenage Learning, ISBN 9788131503140. |
| **Reference Books :** | 1. Yedidyah Langsam, Moshe J Augenstein, Aron M Tenenbaum, ―Data Structures using C and C++‖, Pearson Education, ISBN 81-317-0328-2.<br>2. A Michael Berman, ―Data Structures via C++: Objects by Evolution‖, Oxford University Press, ISBN:0-19-510843-4.<br>3. M. Weiss, ―Data Structures and Algorithm Analysis in C++‖, 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0.<br>4. Brassard & Bratley, ―Fundamentals of Algorithmics‖, Prentice Hall India/Pearson Education, ISBN 13-9788120311312.<br>5. Goodrich, Tamassia, Goldwasser, ―Data Structures and Algorithms in C++‖, Wiley publication, ISBN-978-81-265-1260-7 |

# Computer Graphics (ITUA22174)

**Teaching Scheme :**
Credits : 3
Lectures / Week: 3 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Pre-requisites:** Basic Geometry, Trigonometry, Vectors and Matrices , Data Structures and Algorithms

**Course objectives :**

- To acquaint the learners with the basic concepts of Computer Graphics
- To learn the various algorithms for generating and rendering graphical figures
- To get familiar with mathematics behind the graphical transformations
- To understand and apply various methods and techniques regarding projections, animation, shading, illumination and lighting

**Course Outcomes:**

After completion of the course, student will be able to

1. Understand basic concepts of Computer Graphics and OpenGL.
2. Apply mathematics and logic to develop Computer programs for elementary graphic operations
3. Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics
4. Develop the competency to understand the concepts related to Computer Vision .
5. Apply the logic to develop animation and gaming programs
6. Introduce with the concepts of image processing.

**Unit I : Basic concepts of CG and OpenGL**

Display Files: basic display processor, Display file structure, algorithms and display file interpreter. Primitive operations on display file
OPENGL-Why OpenGL, Features in OpenGL, OpenGL operations, Abstractions in OpenGL – GL, GLU & GLUT, 3D viewing pipeline, viewing matrix specifications, a few examples and demos of OpenGL programs.
Plotting Primitives: Scan conversions, lines, line segments, vectors, pixels and frame buffers, vector generation
Line drawing Algorithms: DDA, Bresenham
Circle drawing Algorithms: -Midpoint, Bresenham
Character Generation: Stroke Principle, Starburst Principle, Bit map method, Introduction to aliasing and anti-aliasing

**Unit II :Polygons And Graphical Transformations**

Polygon and its types, inside test, polygon filling methods: Seed fill, Scan Line, Flood fill and Boundary fill
2D Geometric Transformations - translation, scaling, rotation, other transformations such as reflection, shearing, matrix representation and homogeneous coordinate system, Composite transformations

**Unit III:3D Transformations and Projections**

Translation, scaling, rotation, rotation about X, Y, Z and arbitrary axis reflection about XY, YZ, XZ and arbitrary plane. Projections: Types Parallel - Oblique: Cavalier, Cabinet and orthographic :Isometric, Diametric, Trimetric and Perspective - Vanishing Points as 1 point, 2 point and 3 point

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| **Unit IV: Segments, Windowing and Clipping** | |
| Segment: Introduction, Segment table, Segment creation, closing, deleting and renaming, Visibility<br>Windowing: Concept of window and viewport, viewing transformations<br>Line Clipping: Cohen Sutherland Method, Midpoint subdivision method<br>Polygon Clipping : Sutherland Hodgman method for clipping convex and concave polygons | |
| **Unit V : Shading, Animation and Curves and Fractals** | |
| Shading: Halftoning, Gouraud and Phong Shading Computer Animation: Animation sequences, functions & Languages, Key-frame Systems Curves and Fractals-Introduction, Curve generation, Interpolation, interpolating algorithms, interpolating polygons, Bezier curves, Fractals, fractal lines and surfaces | |
| **Unit VI: Image Manipulation and Storage** | |
| Basic Image fundamentals, image File formats - (BMP, TIFF, JPEG, GIF) Image acquisition, storage processing, Communication, and display Image Compression: Types of Compression: Lossy & Lossless, Symmetrical & Asymmetrical, Intra-frame &Inter-frame , JPEG, Lossless: RLE | |
| **Text books :** | 1. S. Harrington, "Computer Graphics", 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 –100472 – 6.<br>2. D. Rogers, "Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0 – 07 – 047371 – 4. |
| **Reference Books** | 1. D. Hearn, M. Baker, "Computer Graphics – C Version", 2nd Edition, Pearson Education, 2002, ISBN81 – 7808 – 794 – 4.<br>2. D. Rogers, J. Adams, "Mathematical Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2002, ISBN 0 – 07 – 048677 – 8.<br>3. Zhigang Xiang, Roy Plastock, "Computer Graphics", Schaum's Series outlines<br>4. F.S. Hill JR, "Computer Graphics Using Open GL", Pearson Education<br>5. D.P. Mukharjee, Debasish Jana, "Computer Graphics Algorithms and implementation", PHI Learning<br>6.Gonzalez, Woods, "Digital Image Processing" Addison Wesley |

# Computer Organization & Microprocessor ( ITUA22175)

**Teaching Scheme :**
Credits : 3
Lectures / Week: 3 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Pre-requisites:** Fundamentals of Programming Languages-I & II and Basics of Electronics Engineering

**Course objectives :**

- To understand the structure, function and characteristics of computer systems
- To understand the design of the various functional units and components of digital computers
- To identify the elements of modern instructions sets and explain their impact on processor design,
- To explain the function of each element of a memory hierarchy, identify and compare different methods for computer Input Output,
- To compare simple computer architectures and organizations based on established performance metrics.

**Course Outcomes:**

After completion of the course, student will be able to

1. Explain processor structure & its functions.
2. Solve problems based on computer arithmetic.
3. Obtain knowledge about micro-programming of a processor.
4. Understand concepts related to memory & IO organization.
5. Acquire knowledge about instruction level parallelism & parallel organization of multiprocessors & multi core systems.
6. Understand concepts related to Multicore Computers.

**Unit I :Computer Evolution and Performance Measures**

Computer Organization and Architecture, Designing for Performance ( performance assessment), Evolution of Intel x86 Architecture- 4 bit to 64 bit, A brief history of computers, CISC vs RISC: Speed, Throughput, and Peripheral Interfacing, A top level view of Computer function and interconnection- Computer Components, Computer Function, Interconnection structure, bus interconnection.

**Unit II :Computer Arithmetic**

The Arithmetic and Logic Unit, Addition and subtraction of signed numbers, Multiplication of positive numbers, Signed operand multiplication, Booths algorithm, Fast multiplication, Integer division, Floating point representation and operations – IEEE standard, Arithmetic operations, Guard bits and truncation.

**Unit III: The Control Unit**

Instruction level parallelism and superscalar processors - Super scalar verses super pipelined, constraints, Design Issues- Instruction level and machine parallelism, Instruction issue policy, Register renaming, Machine parallelism, Hardwired control, Micro-programmed control- micro instructions, Micro program sequencing, Wide branch addressing, Microinstruction with next address field, Prefetching microinstructions and emulation.

**Unit IV: Processor Structure**

Architecture of 8086, Processor organization, Register organization- user visible registers, Control and

status registers, Instruction Cycle- The indirect cycle and Data flow, Instruction Pipelining- Pipelining Strategy, Pipeline performance, Pipeline hazards, Dealing with Branches, Characteristics and Functions- Machine instruction characteristics, Types of operands, Types of operations- Data transfer, Arithmetic, logical, Conversion, Input-output, System control, and Transfer of control, Addressing modes and Formats- Addressing modes- Immediate, Direct, Indirect, Register, Register indirect, Displacement and Stack, Instruction Formats- Instruction length, Allocation of bits, Variable length instructions.

**Unit V :Computer Memory System**

Characteristics of memory system, The memory hierarchy, Cache Memory- Cache memory principles, Elements of cache design- Cache address, Size, Mapping functions, Replacement algorithms, Write policy, Line size, Number of cache, One level and two level cache, Performance characteristics of two level cache- locality & operations, Case Study- pentium4 cache organization.

**Unit VI: Multicore Computers**

Hardware Performance Issues, Software Performance Issues, Multicore Organization, Intel x 86 Multicore Organizations.

**Text Books :**

1. W. Stallings, Computer Organization and Architecture: Designing for performance‖, Pearson Education/ Prentice Hall of India, 2003, ISBN 978-93-325-1870-4, 7th Edition**.**
2. Zaky S, Hamacher, Computer Organization‖, 5th Edition, McGraw-Hill Publications, 2001, ISBN- 978-1-25-900537-5, 5th Edition.

**Reference Books :**

1. John P Hays, Computer Architecture and Organization‖, McGraw-Hill Publication, 1998, ISBN:978-1-25-902856-4, 3rd Edition.
2. Miles Murdocca and Vincent Heuring, Computer Architecture and Organization- an integrated approach, Wiley India Pvt. Ltd, ISBN:978-81-265-1198-3, 2nd Edition.
3. A. Tanenbaum, Structured Computer Organization‖, Prentice Hall of India, 1991 ISBN: 81 – 203 – 1553 – 7, 4th Edition.
4. Patterson and Hennessy, Computer Organization and Design‖, Morgan Kaufmann Publishers In, ISBN 978-0-12-374750-1, 4th Edition.

# Social Science and Engineering Economics ( ITUA22176)

**Teaching Scheme :**
Credits : 3
Lectures / Week: 3 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Prerequisites :** NIL

**Course objectives**

- This course will lead to the learning of
- Human and social development.
- Contemporary national and international affairs.
- Emergence of Indian society and Economics.
- Sectoral development and Economic development and related issues (such as international economics, WTO, RBI, etc).

**Course Outcomes**

After completion of the course, student will be able to

1. Understand various issues concerning human and society.
2. Realize social, cultural, economic and human issues, involved in social changes
3. Understand the nature of the individual and the relationship between the self and the community
4. Express their opinion about national health and education policies.
5. Understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.
6. Understand the fundamental concepts in engineering economics

**Unit I - Indian Society**

Structure of Indian Society, Indian Social Demography– Social and Cultural, Differentiations: caste, class, gender and tribe; Institutions of marriage, family and kinship- Secularization –Social Movements and Regionalism- Panchayatraj Institutions; Affirmative Action Programme of the Government-various reservations and commissions.

**Unit II - Social Development**

Scientific approach to the study of human beings. Evolution of human kind, social change and evolution. Industrial revolution. National policy on education, health and health care and human development.

**Unit III – Sectoral Development**

Agriculture: Technology changes, Green revolutions, Employment Rural and Urban, Government Schemes. Industrial Development: Strategies, Public and Private Sectors, Categories, infrastructure, transport and communication, Consumer Awareness.

**Unit IV - Economic Development**

Need for planned economic development – Law of demand and supply. Planning objective, five years plan, priorities and problems. Population and development.
Indian Economics – basic features, natural resources population size and composition, national income concepts, micro economics of India, inflation, GDP.

**Unit V - Banking and Trades**

Financial Analysis, Ratios, Cost Analysis, financial Institutions, Finance Commissions, Budget Analysis. Indian

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| Banking, Role of Reserve bank of India International Economy, WTO, International aid for economic growth. |
| **Unit VI - Understanding Cash Flow and Taxes** |
| Accounting for Depreciation and Income Taxes, Project Cash-Flow Analysis, Understanding Financial Statements, Case Studies - cash flow analysis done in start-up companies. |
| Text Books |
| 1. Krugman, International Economics, Pearson Education.<br>2. Prakash, The Indian Economy, Pearson Education.<br>3. Thursen Gerald, Engineering Economics, Prentice Hall.<br>4. C.S. Rao, Environmental Pollution Control Engineering, New Age International Pvt. Ltd. |
| Reference books: |
| 1. Rangarajan, Environmental Issues in India, Pearson Education.<br>2. University of Delhi, The Individual & Society, Pearson Education.<br>3. Wikipedia.org / wiki /social studies.<br>4. M. N. Srinivas, Social change in modern India, 1991, Orient Longman.<br>5. David Mandelbaum, Society in India, 1990, Popular |

# Lab Practice –II (ITUA22177)

**Teaching Scheme :**
Credits : 3
Practicals / Week: 6 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : 50

**Pre-requisites:** C and C++ Programming ,Fundamentals of data Structures, OOP

**Course objectives :**

- Understand different advanced abstract data type (ADT), data structures and different types of file organizations and their implementations.
- To decide and apply appropriate data structures for any given application
- To learn the various algorithms for generating and rendering graphical figures
- To get familiar with mathematics behind the graphical transformations
- To learn assembly language programming of 80386 microprocessors.
- To learn interfacing of real world input and output devices to microprocessors.

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

1. Implement various data structure such as trees, graphs, symbol tables etc. to solve various computing problems.
2. Ability to apply learned algorithm design techniques, data structures and file organization to solve problems.
3. Apply mathematics and logic to develop Computer programs for elementary graphic operations.
4. Apply the logic to develop animation and complex graphics operations.
5. Students will learn concepts related to assembly language programming.
6. Students will be able to write and execute assembly language program to perform array addition, code conversion, block transfer, sorting and string operations

**PART-I Data Structure and File Laboratory**

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| 1 | a) Construct an expression tree from postfix/prefix expression and perform recursive inorder, preorder and post order traversals. |
| | b) For expression tree, perform non-recursive inorder, preorder and post order traversals. |
| 2 | a) Construct an inorder threaded binary tree from inorder / postorder expression. |
| | b) Traverse threaded binary tree it in inorder and preorder. |
| 3 | a) Use the map of the area around the college as the graph. Identify the prominent land marks as nodes and find minimum distance to various land marks from the college as the source. Represent this graph using adjacency matrix |
| | b) find the shortest path using Dijkstra's algorithm. |
| 4 | a) Represent any real world graph using adjacency list /adjacency matrix |
| | b) Find minimum spanning tree using Kruskal's algorithm. |
| 5 | a) Store data of students (with telephone number and name in the structure) using hashing function for telephone number and implement linear probing using chaining without replacement algorithm. |

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| | b) Store data of students (with telephone number and name in the structure) using hashing function for telephone number and implement linear probing using chaining with replacement algorithm. |
| 6 | a) Implement an index sequential file for any Database and perform following operations on it i) Create Database ii) Display Database iii) Add a record |
| | b) On index sequential file, perform<br>iv) Delete a record v)Modify a record. |
| | ***All assignments to be implemented using C++ on Linux platform.** |
| **PART II-Computer Graphics Laboratory** | |
| | **Group A** |
| 1 | Use DDA algorithm for line drawing. |
| 2 | Use Bresenham's algorithm for line drawing. |
| 3 | Draw circles Using any Circle drawing algorithms. |
| 4 | 4a. Implement seed fill algorithm (Boundary fill)for concave polygon. |
| | 4b. Implement seed fill algorithm (Flood Fill)for concave polygon. |
| | **Group B** |
| 1 | 1a. Implement Cohen Sutherland Hodgeman algorithm to clip any given polygon.(Left and Right Side of Window) |
| | 1b. Implement Cohen Sutherland Hodgeman algorithm to clip any given polygon (Top and Bottom side of window) |
| 2 | 2a. Implement translation, rotation and scaling transformations on equilateral triangle. |
| | 2b. Implement Shear and Reflection transformations on equilateral triangle. |
| 3 | Implement Cube rotation about x, y, and z axis. |
| 4 | 4a.Animation: Draw the Scene for your animation sequence. |
| | 4b.Implement animation assignments on the created scene. E.G Moving car / Windmill etc. |
| | ***All assignments to be implemented using C++/C on Linux Platform in OPENGL.** |
| **PART-III Computer Organization and Laboratory** | |
| 1 | a. Write 8086 ALP to add array of N hexadecimal nos. Prompt the user to enter the count of numbers (N) and the numbers in 1-digit hexadecimal format. |
| | b. Write 8086 ALP to add array of N hexadecimal nos.Prompt the user to enter the count of numbers (N) and the numbers in 2-digit hexadecimal format. |
| 2 | a. Write 8086 ALP to perform non-overlapped block transfer |
| | b. Write 8086 ALP to perform overlapped block transfer |

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| 3 | a. Write 8086 ALP to convert 4-digit Hex number into its equivalent BCD number. |
| | b. Write 8086 ALP to convert 5-digit BCD number into its equivalent HEX number. |
| 4 | a. Write ALP to perform following operation on string:<br>i. Accept the string<br>ii. Display length<br>Display proper strings to prompt the user while accepting the input and displaying the result. Write NEAR procedures to complete the task. |
| | a. Write ALP to perform following operation on string:<br>i. Display reverse<br>ii. Check whether string is palindrome or not.<br>Display proper strings to prompt the user while accepting the input and displaying theresult. Write NEAR procedures to complete the task. |
| | a. Write ALP to perform following operation on string:<br>i. Check whether string is palindrome or not.<br>Display proper strings to prompt the user while accepting the input and displaying theresult. Write near procedures to complete the task. |
| 5 | a. Write menu driven ALP to perform string manipulations. The strings to be accepted from the user is to be stored in code segment Module_1 and write FAR PROCEDURES in code segment Module_2 to perform any the following string operations:<br>i. Concatenation of two strings.<br>Note: Use PUBLIC and EXTERN directives. Create .OBJ files of both the modules and link them to create an .EXE file |
| | b. Write menu driven ALP to perform string manipulations. The strings to be accepted from the user is to be stored in code segment Module_1 and write FAR PROCEDURES in code segment Module_2 to perform any the following string operations:<br>i. Comparison of two strings.<br>Note: Use PUBLIC and EXTERN directives. Create .OBJ files of both the modules and link them to create an .EXE file. |
| 6 | Write menu driven program in C using int86, int86x, intdos and intdosx functions for implementing following operations on file.i. To delete a file ii. To create a directory |

# Skill Development –II (DSF using C++) (ITUA22178)

**Teaching Scheme :**
Credits : 1
Practicals / Week: 2 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : NA

**Pre-requisites:** Fundamentals of data structure knowledge, C and C++ Programming **,** OOP

**Course objectives:**

- To apply appropriate coding knowledge and coding practices for application development.
- To select and use appropriate data structures and algorithms for any given application.

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

1. To develop and apply learnt programming skills for solving applications.

**List of Assignments:**

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| 1 | a) Create a binary search tree (BST) of mnemonics from assembly language (e.g. add, mult, div, sub etc.) and perform following operations:<br>i) Insert ii) Display inorder iii) Search a node |
| | b) Perform following operations on BST. ,<br>i) Delete ii) Find depth of the tree iii) Find mirror image iv) level wise display |
| 2 | a) Consider a friends' network on face book social web site. Model it as a graph to represent each node as a user and a link to represent the fried relationship between them. Store data such as date of birth, number of comments for each user.<br>i) Find who is having maximum friends<br>Hint: Use adjacency list representation |
| | b) For a friends' network,<br>ii) Find who has post maximum and minimum comments<br>iii) Find users having birthday in this month.<br>Hint: perform DFS and BFS traversals |
| 3 | a) A business house has several offices in different countries; they want to lease phone lines to connect them with each other and the phone company charges different rent to connect different pairs of cities. Business house want to connect all its offices with a minimum total cost.<br><br>i) Represent using appropriate data structure. |
| | b) Apply suitable algorithm to find minimum total cost. |
| 4 | a) The internship is offered to students based on rank obtained in second year of graduation. Create suitable non-linear data structure to identify next topper student for internship. |
| | b) Also, the extra academic input is to be given to the 10 students with low grades. Sort the student data in ascending order of grades. |
| 5 | a) Implementation of B tree for suitable database.<br>i) Add record |
| | b) ii) Search record in B tree |
| 6 | a) Implement student database using direct access file (chaining without replacement). |

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| | i) insert record<br>ii) Display records |
| | b) In a direct access file<br>iii)Search record<br>iv) Modify record |
| | ***All assignments to be implemented using C++ on Linux platform.** |

**Text Books**

1. Horowitz and Sahani, ―Fundamentals of Data Structures in C++, University Press, ISBN 10: 0716782928 ISBN 13: 9780716782926.
2. Brassard &Bratley, ―Fundamentals of Algorithmic , Prentice Hall India/Pearson Education, ISBN 13-9788120311312
3. R. Gillberg, B. Forouzn, ―Data Structures: A Pseudo code approach with C‖, Cenage Learning, ISBN 9788131503140.
4. Horowitz, Sahani and Rajshekaran, ―Fundamentals of Computer Algorithms‖, University Press, ISBN-13, 9788175152571
5. Introduction to Algorithms 3rd Edition by Thomas H. Cormen, Charles E.Leiserson,Ronald L Rivest,& Clifford Stein, MIT Press ,Cambridge MA USA ,ISBN 978-81-203-4007-7
6. M. Weiss, ―Data Structures and Algorithm Analysis in C++, 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0.

# Project Management (ITUA22179)

**Teaching Scheme :**
Credits : 2
Lectures / Week: 2 Hrs

**Examination Scheme**
Formative Assessment : 50
Summative Assessment : NA

**Prerequisite:** NIL

**Course Objectives:**

- Students will gain the knowledge about principles of Project Management.
- Students will understand and apply Project Management Life Cycle.
- Student will understand the project cost estimation and project scheduling and monitoring.
- Student will learn S/W project development and expand on the tools, techniques, and benefits of using a standard project management methodology.

**Course Outcomes:**

After successful completion of the course, student will be able to

1. Understand the Basic Project Management Concepts.
2. Understand organizational structure and initiation of project
3. Analyze and Understand the Project Cost Estimation.
4. Understand project planning and scheduling of project.

**Unit I - Project Management Concepts**

Project Management Concepts Introduction, Project Characteristics, Taxonomy of projects, Project identification and formulation. Establishing the project and goals. Nature & context of project management; Phases of project management, A framework for project management issues, Project management as a conversion process, Project environment & complexity. Organizing human resources, Organizing systems & procedures for implementation. Project direction.

**Unit II - Project Organization & Project Contracts**

Introduction, Functional organization, Project organization, Matrix organization, Modified matrix organization, Pure project organization, Selection of project organization structure, Project breakdown structures, Project contracts, Types of contracts, Types of payments to contractors

**Unit III –Project Cost Estimation**

Cost analysis of the project, Components of capital cost of a project, Modern approach to project performance analysis, The COCOMO II Model

**Unit IV -Project Planning & Scheduling**

Introduction to PERT & CPM, Planning and scheduling networks, Time estimation, Determination of critical path, CPM model, Event slacks & floats, PERT model, Expected time for activities, Expected length of critical path, Calculating the project length and variance, PERT & CPM cost accounting systems, Lowest cost schedule, Crashing of networks, Linear programming formulation of event oriented networks.

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| **Text books**<br>1. Project Management by Harvey Maylor, Pearson India<br>2. Project Management by Choudhury, McGraw Hill<br>3. Project Management: A Systems Approach to Planning, Scheduling and Controlling, by Kerzner, Willey |
| **Reference books**<br>1. Project Management: A Life Cycle Approach by Kanda, PHI, India<br>~~2.~~ Ian Sommerville " Software Engineering" 9th edition Pearson Education |