Curriculum for

S.Y.B.Tech.

(Pattern 2018)

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.

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

S.Y.B.Tech.

2018 Pattern

Syllabus Structure

Second Year B. Tech. Information Technology (SYBT) - Semester III (Pattern 2018)

Course Code	Course	Course Type	Teaching Scheme			Examination Scheme						Total	Credits
						Formative Assessment			Summative Assessme				
						ISE		CE	ESE	PR / OR			
			L	T	P	T1	T2						
ITUA21181	Analog and Digital Electronics	TH	3	1	-	20	10	20	50	-	100	4
ES21182IT	Discrete Mathematics	TH	3	-	-	20	10	20	50	--	100	3
ITUA21183	Data Communication *	TH	3	-	-	20	10	20	50	-	100	3
ITUA21184	Computer Organization	TH	3	-	-	20	10	20	50	-	100	3
ITUA21185	Fundamentals of Data Structures *	TH	3	-	-	20	10	20	50	-	100	3
ITUA21186	Lab Practice - I	CE PR/OR	-	-	6	-	-	50	-	50	100	3
ITUA21187	Object Oriented Programming	CE	2	-	2	-	-	100	-	-	100	3
M2	Mandatory Course	AU	-	-	-	-	-	-	-	-	-	-
	Total		17	1	8	100	50	250	250	50	700	22

Theory: 1Hr. = 1 Credit, Practical: 2 Hrs. = 1 Credit, #1 hr. = 1 Credit, Audit Course: No Credits
*These Courses have lab practice component (FDS-4hrs/week, DC-2 hrs /week)

Mandatory Courses: Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge.

BoS Chairman   **Dean Academics**   **Director**

Second Year B. Tech. Information Technology (SYBT) - Semester IV (Pattern 2018)

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					
ES22181IT	Engineering Mathematics – III	TH	3	1	-	20	10	20	50	-	100	4
ITUA22182	Data Structure and Files *	TH	3	-	-	20	10	20	50	-	100	3
ITUA22183	Computer Networks*	TH	3	-	-	20	10	20	50	-	100	3
ITUA22184	Software Engineering	TH	3	-	-	20	10	20	50	-	100	3
ES22185IT	Social Science & Engg. Eco.	TH	3	-	-	20	10	20	50	-	100	3
ITUA22186	Lab Practice - II	CE PR/OR	-	-	6	-	-	50	-	50	100	3
ITUA22187	IT Workshop in Java	CE	2	-	2	-	-	100	-	-	100	3
ITUA22188	Cyber Security	CE	2	-	-	-	-	100	-	-	100	2
M2	Mandatory Course	AU	-	-	-	-	-	-	-	-	-	-
	Total		19	1	8	100	50	350	250	50	800	24

Theory: 1Hr. = 1 Credit, Practical: 2 Hrs. = 1 Credit, #1 hr. = 1 Credit, Audit Course: No Credits
*These Courses have lab practice component (DSF - 4hrs/week, CN-2 hrs / week)

Mandatory Courses: Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge

BoS Chairman   **Dean Academics**   **Director**

S.Y.B.Tech

2018 Pattern

Semester - I

Syllabus Curriculum

Vishwakarma Institute of Information Technology, Pune-48

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Department of Information Technology

Analog and Digital Electronics (ITUA21181)

Teaching Scheme
Credits: 4
Lecture's / Week: 3Hrs/week
Tutorial's / Week: 1Hrs/week

Examination Scheme
Formative Assessment: 50
Summative Assessment: 50

Prerequisites : Basic Electronics Engineering	

Course Objectives :

- To learn basic digital circuit design techniques.
- To study the implementation of digital circuits using combinational logic.
- To explain and implement circuits using sequential logic.
- To illustrate the concept of PLD's & ASM.
- To show the implementation of digital circuits using VHDL.
- To explain the basics of Logic Families.

Course Outcomes :
After studying this course, students will be able to:
1. Simplify Boolean algebraic expressions for designing digital circuits using K-Maps. (Analyzing)
2. Apply digital concepts in designing combinational circuits. (Applying)
3. Apply digital concepts in designing sequential circuits. (Applying)
4. Design digital circuits using PLA and PAL. (Creating)
5. Develop digital circuits using VHDL. (Creating)
6. Design and implement Mini digital circuits. (Creating)

Unit I – Number System and Logic Minimization Techniques

Number System: Introduction, Binary number System, Sign-Magnitude representation, One's and Two's complement representation, Binary arithmetic, 2's complement arithmetic, Octal number System, Hexadecimal number System, Basic theorems and properties.

Logic minimization: Representation of truth-table, Sum of Product (SOP) form, Product of Sum (POS) form, Simplification of logical functions, Minimization of SOP and POS forms using K-Maps up to 4 variables and Quine-McCluskey Technique, realization of logic gates.

Unit II - Combinational Logic

Design of Combinational Logic: Code converter - BCD, Excess-3, Gray code, Binary Code. Half- Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder (IC 7483), BCD adder, Look ahead carry generator, Multiplexers (MUX): MUX (IC 74153, 74151), MUX tree, DE multiplexers (DEMUX)- Decoder. (IC 74138, IC 74154). DMUX Tree, Implementation of SOP and POS using MUX, DMUX, Comparators, Parity generators and Checker, One bit, Two bit , 4-bit Magnitude Comparator

Unit III – Sequential Logics

Flip-flop: SR, JK, D, T; Preset & Clear, Master and Slave Flip Flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop. **Registers:** Buffer register, shift register (SISO, SIPO, PISO& PIPO), Applications of shift registers.

Unit IV - Counters
Counters: Asynchronous counter. Synchronous counter, ring counters, Johnson Counter, Modulus of the counter (IC 7490). **Synchronous Sequential Circuit Design:** Models – Moore and Mealy, State diagram and State Tables, Design Procedure, Sequence generator and detector. **Asynchronous Sequential Circuit Design:** Difference with synchronous circuit design, design principles and procedure, applications.

Unit V – Logic Families
Classification of logic families: Unipolar and Bipolar Logic Families, Characteristics of Digital ICs: Speed, power dissipation, figure of merits, fan-out, Current and voltage parameters, Noise immunity, operating temperature range, power supply requirements. **Transistor-Transistor Logic:** Operation of TTL, TTL characteristics. **CMOS:** CMOS Inverter, CMOS characteristics, CMOS configurations- Wired Logic, Open drain outputs. **Interfacing:** TTL to CMOS and CMOS to TTL. **Digital Circuit Implementation using IOT:** Introduction to soldering techniques and its types, Mounting of electronic components on PCB. Introduction and applications of Raspberry pi and Arduino architecture.

Unit VI - Introduction to PLD's & VHDL
Introduction to PLD's: - PAL, PLA, Applications of PLAs to implement combinational and sequential logic circuits, FPGA and CPLD. **VHDL:** Introduction to HDL, Data Objects & Data Types, Attributes., VHDL-Library, Design Entity, Architecture, Modeling Styles, Concurrent and Sequential Statements. **Design Examples:** VHDL for Combinational Circuits-Adder, MUX, VHDL for Sequential Circuits, Synchronous and Asynchronous Counter.

Text books :	1. R. P. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw-Hill, 2003, ISBN0 – 07 – 049492 – 4. 2. J. Bhaskar, "VHDL Primer" 3rd Edition, Pearson Edition. 3. Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL Design", McGraw Hill, ISBN–13:978-1-25-902597-6. 4. G.K.Kharate, "Digital Electronics", Oxford University Press.
Reference Books :	1. John Yarbrough, "Digital Logic applications and Design" Thomson. 2. Flyod "Digital Principles", Pearson Education. 3. Malvino, D.Leach "Digital Principles and Applications", 5th edition, Tata Mc-Graw Hill. 4. Douglas L. Perry, "VHDL Programming by Example", Tata McGraw Hill. 5. G. K. Kharate, "Digital Electronics", Oxford University Press.

Tutorial List: Analog and Digital Electronics laboratory

Course Objectives :	
• To understand the functionality and design of Combinational and Sequential Circuits.	
• To learn designing and implementing digital circuits using VHDL.	
Course Outcomes :	
After completion of the course, student will be able to	
1. Realize and simplify Boolean Algebraic assignments for designing & implementing Sequential a Combinational digital circuits using K Maps.	
2. Design simple digital systems using VHDL.	
1	Number system conversion and 2's compliment arithmetic.
2	Realize Full Adder and Sub tractor using a) Basic Gates and b) Universal Gates.
3	Design and implement Code converters-Binary to Grey and BCD to Excess-3.
4	Design and Realization of BCD Adder using 4-bit Binary Adder (IC 7483).
5	Design of Ripple Counter using JK-Flip Flops.
6	Design 3 bit Synchronous Up/Down Counter using JK-Flip Flop.
7	Design and implement Mod -N counter using IC-7490.
8	Simulation of - Full adder using behavioural modelling style of VHDL.
9	Simulation of – 4:1 MUX using data flow modelling style of VHDL.
10	Mini project: Nowadays digital electronics deals with the logic gates, flip-flops, CMOS – the foundation for modern computers and digital communications. Students are expected to apply their knowledge to design and develop a simple digital system as a part of this project.

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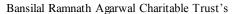
Department of Information Technology

Discrete Mathematics (ES21182IT)

Teaching Scheme   **Examination Scheme**

Credits: 3   Formative Assessment : 50

Lectures / Week: 3Hr /Week   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 fundamental principles of graph
- To study fundamental principles of trees elementary combinational processes
- To study fundamental principles of probability theory
- To study basic of logic and set 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. 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 $-7808-279-9$. 2. B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures", 4th Edition, Pearson Education, 2002, ISBN 81-7808-556-9 3. N. Deo, "Graph Theory with application to Engineering and Computer Science", Prentice Hall of India, 1990, $0-87692-145-4$ 4. Eric Gossett, "Discrete Mathematics with proof", 2nd edition, Wiley Student Edition, ISBN: 978-81-265-2758-8

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Department of Information Technology

Data Communication (ITUA21183)

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

Examination Scheme
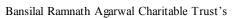Formative Assessment: 50
Summative Assessment: 50

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. Differentiate the analog and digital signals and their characteristics.
2. Categories various modulation and multiplexing techniques.
3. Identify and use various transmission media in various network scenarios.
4. Understand OSI layers, TCP/IP protocol stack and describe various network topologies.
5. Exercise error correction techniques.
6. Compare and describe multiple access methods.
7. Work in a group to understand, prepare and present a given case study.

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
Performance: Bandwidth, Throughput, Latency (delay)

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. (RJ45, RJ11, BNC, SC/ST etc.) Circuit-switched Networks: Three Phases, Packet switching : Datagram networks, Virtual circuit networks
Brief introduction of Digital Subscriber Line: ADSL, HDSL, SDSL, VDSL (DMT).

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, Connecting devices: Hubs, Repeaters, Active hubs, Bridges, Switches, Routers, Gateway	
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	
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).	
Text books :	1.Fourauzan B., "Data Communications and Networking", 5th edition, McGraw-Hill Publications 2. Stallings William., "Data and Computer Communications", Sixth Edition, Prentice Hall of India
Reference Books:	1. Andrew S. Tenenbaum ,"Computer Networks", Pearson 2. Douglas E. Comer, "Computer Networks and Internets", Pearson Education

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Department of Information Technology

Computer Organization (ITUA21184)

Teaching Scheme   **Examination Scheme**

Credits: 3   Formative Assessment: 50

Lectures / Week: 3Hrs/week   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.

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. Discover Instruction level processing
5. Understand concept related to memory and IO organization.
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, A brief history of computers, CISC vs RISC: Speed, Throughput. 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

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

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 Processors
Why Multicore? Architecture: Multicore & Multiprocessor, Hardware Performance Issues, Software Performance Issues, Multicore Organization, Applications, Advantages and challenges, Examples, Intel x86 Multicore Organizations, Recent trends in Multicore.

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.

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Department of Information Technology

Fundamentals of Data Structures   (ITUA21185)

Teaching Scheme	Examination Scheme
Credits: 3	Formative Assessment: 50
Lectures / Week: 3Hrs/week	Summative Assessment: 50

Pre-requisites: Computer Fundamentals

Course objectives :
- To understand the different ways of data representation.
- To develop the ability to analyze algorithms.
- To enable students to write algorithms for solving problems with the help of fundamental data structures.
- To understand concepts about searching and sorting techniques.
- To study the implementation and applications of linear data structures.

Course Outcomes:

After completion of the course, student will be able to
1. Summarize appropriate constructs of a programming language including pointers and file handling.
2. Recognize algorithmic foundations and basics of analysis of algorithms.
3. Select appropriate searching and/or sorting techniques in the application development.
4. Apply various linear data structures using sequential organization for problem solving and programming.
5. Apply various linear data structures using linked organization for problem solving and programming.
6. Use 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. 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 2. Y. Langsam, M. Augenstin and A. Tannenbaum, "Data Structures using C and C++", 2ndEdition, Prentice Hall of India, 2002, ISBN-81-203 -1177-9 3. J. Tremblay, P. Soresan, "An introduction to data structures with Applications", 2ndedition, Tata McGraw-Hill International Editions, 1984, ISBN-0-07-462471-7.

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Department of Information Technology

Lab Practice -I (ITUA21186)

Teaching Scheme	**Examination Scheme**
Credits: 3	Formative Assessment: 50
Practical's / Week: 6Hrs/week	Summative Assessment: 50

Course objectives :
- To understand the different ways of data representation.
- To understand concepts about searching and sorting techniques.
- To study the implementation and applications of linear data structures.

Course Outcomes:

After completion of the course, student will be able to
1. Summarize appropriate constructs of a programming language including pointers and file handling.
2. Select appropriate searching and/or sorting techniques in the application development.
3. Apply various linear data structures using sequential and linked organization for problem solving and programming.
4. Use advanced linear data structures stack and queue for problem solving and programming.

PART I-Programming Laboratory

1	a) In a class of n students, some students like Math, some like science and some like both the subjects. Find the students who like (i) Either Math or Science (ii) Both Math and Science
	b) Find the students who like (iii) Math only (iv) Science only
2	a) Perform matrix operations without pointers.
	b) Perform matrix operations with pointers.
3	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
4	a) Create database for employees of an organization using sequential file and perform following operations: i. Display ii. Add records iii. Search record
	b) Perform following operations on employee database iv. Modify record v. Delete record vi. Sort using Bubble sort
5	a) Sort the set of strings in ascending order using Insertion sort and descending order by using Selection sort. (Display pass by pass output)
	b) Search a particular string using binary search with and without recursion.

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6	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**)
7	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.
8	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
9	a)Implement any database using doubly linked list with following options i. Insert a record ii. Display list forward iii. Display list backward
	b) iii. Modify a record iv. Delete a record
10	a) Implement polynomial using CLL and perform i. Addition of Polynomials
	b) Implement polynomial using CLL and perform ii. Multiplication of polynomials and iii. Evaluation of polynomial
11	a) Implement stack ADT using linked list. Write a program for Expression Evaluation using stack.
	b) Write a program for Expression Conversion using stack.
12	Implement a circular Queue.
13	Implement a priority Queue for a list of patients using linked list.

*All assignments to be implemented using C/C++ on Linux platform.

PART-II Data Communication Laboratory

1	Network Representation on Network Simulator tool
2	Configuration of initial Switch setting using secure Passwords and SSH
3	Study of DCE, DTE, straight and cross cables
4	Implementation of basic connectivity in a small network.
5	Identify MAC and IP addresses.
6	To examine the ARP table.
7	Implementation of wireless LAN.
8	Study of Basic router configuration and introduction of iOS.
9	To design subnets as per given requirement.
10	Study of campus wide network and prepare a report.

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Object Oriented Programming   (ITUA21187)

Teaching Scheme	**Examination Scheme**
Credits: 3	Formative Assessment: 100
Lectures / Week: 2Hrs/week	Summative Assessment: NA
Practical's / Week: 2Hrs/week	

Pre-requisites: Basics of Computer programming.

Course Objectives :
-
- To understand object-oriented concepts such as data abstraction, encapsulation, inheritance, dynamic binding, and polymorphism.
- To use the object-oriented paradigm in program design.
- Provide programming insight using OOP constructs.
- To lay a foundation for advanced programming.

Course Outcomes:
After completion of the course, student will be able to
1. Comprehend the concept of OOP.
2. Apply concept of reusability to solve the problems
3. Implement programmes using generic programming concepts and exception handling
4. Perform file operations using streams and file concepts.

Unit I – Classes and Objects

Need of object oriented programming, Introduction OOP, Procedural Vs. object oriented programming, Principles of OOP, Benefits and applications of OOP, Program structure: namespace, identifiers, variables, constants, enum, operators, typecasting, control structures, object oriented programming language, data types, array and string, class, object, class & data abstraction, class scope & accessing data members, controlling access to members .

Unit II - **Inheritance and Polymorphism**

Base class, derived class, public, private & protected keywords, types of inheritance, ambiguity in multiple inheritance, classes within classes, Polymorphism concept, types of polymorphism, function overloading, operator overloading, Unary operator overloading & binary operator overloading. friend function, static function, this pointer, virtual function, dynamic binding.

Unit III - Exception Handling & Templates

Fundamentals, exception handling using try-throw-catch, standard exceptions, User defined exceptions. Generics, Generic programming, Class templates, function templates. Introduction to STL, Components of STL – Containers, Iterators and Algorithms, List, Vector, set, minmax, algorithm header files. Smart pointers concept, shared pointers concept, memory leak problem.

Unit IV - Streams and Files
Stream concept, File pointers, File I/O classes, File I/O functions, and insertion and Extraction operators in file streams.

Text books :
1. Behrouz A. Forouzan, Richard F. Gilberg, "COMPUTER SCIENCE – A Structred Programming approach using C", Indian Edition, Thomson, 3rd edition 2. BjarneStroustrup, ― The C++ Programming language‖, Third edition, Pearson Education. ISBN 9780201889543

Reference Books :
1. Kernighan, Ritchie, "The C Programming Language", Prentice Hall of India 2. Robert Lafore, ―Object-Oriented Programming in C++, fourth edition, Sams Publishing, ISBN:0672323087 (ISBN 13: 9780672323089) 3. Herbert Schildt, ―C++ The complete reference‖, Eighth Edition, McGraw Hill Professional, 2011, ISBN:978-00-72226805 4. E. Balagurusamy-- Object-oriented programming with C++, fourth edition, Mc Hill Professional,2008, ISBN 978-0-07-066907-9

	Assignments : 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 **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.
	
	a. Write a menu driven program to carry out the following operations:
	
	      i. Build a master table ii. Display iii. Insert a new entry
	
	b .Write a menu driven program to carry out the following operations:
	
	  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
	
	  ii. A function to calculate the division of these two numbers
	  iii. A try block to detect and throw an exception if the condition "divide-by-zero" occurs
	  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 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

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S.Y.B.Tech

2018 Pattern

Semester - II

Syllabus Curriculum

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Department of Information Technology

Engineering Mathematics-III (ES22181IT)

Teaching Scheme :
Credits: 4
Lectures / Week: 3 Hrs/week
Tutorials / Week: 1 Hrs/week

Examination Scheme
Formative Assessment: 50
Summative Assessment: 50

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

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Course objectives:
- To study the Linear Differential equations and their applications
- To impart knowledge of Fourier transform and Z- transform
- To apply Numerical techniques for data analysis.
- To apply statistical techniques for data analysis.
- To solve probability distributions.
- To solve complex variables and complex integrations.

Course Outcomes:
After successful completion of the course, student will be able to
1. Solve the Linear Differential equations, modelling of mass spring systems, free and forced damped and undamped systems..
2. Solve Fourier Transform and Z-Transform.
3. Solve Numerical technique to analyses the data.
4. Solve statistical technique to analyze the data.
5. Solve Different Probability Distributions .
6. Solve Complex variables and Applications of CR Equations.

Unit I : Linear Differential Equations

LDE of nth order with constant coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous Differential Equations, Modeling of Electrical circuits.

Unit II :Transforms

Fourier Transform (FT): Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses.

Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations..

Unit III: Computer oriented Numerical Methods

Solution of Simultaneous equations by Gauss Jacobi method, Gauss Seidel method, Solutions of Differential equations by Euler method, Euler modified method, Rungekutta 4th order method.

Unit IV: Statistics
Measures of Central Tendency, Standard Deviation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates.
Unit V : Probability
Theorems and Properties of Probability, Probability Distributions: Binomial, Poisson, Normal and Hyper geometric; Test of Hypothesis: Chi-Square test. Applications of statistics in Data Analysis.
Unit VI: Complex Variables.
Complex Variables Functions of Complex Variables, Analytic Functions-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Integral Theorem, Cauchy's Integral formula, Residue Theorem.
Text books :
1.A Text book of Applied Mathematics by P.N. Wartikar, U.N.Wartikar (Pune Vidyarthi Griha Prakashan ,Pune) (Volume II-ISBN 81-85825-07-6)((Volume III-ISBN 81-85825-01-7)   2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).(*ISBN* 978-0-470-45836-5.)
Reference Books :
1.Higher Engineering Mathematics by B.S.Grewal (Khanna Publication, Delhi)(*ISBN*-13. 978-81-7409-195-5. *ISBN*-10. 81-7409-195-5)   2. Advanced Engineering Mathematics by Wylie C.R &Barrett L.C.(McGraw-Hill,INC)(*ISBN* 0 - 07 -463841 – 6)   3. Advanced Engineering Mathematics by Peter V.O'Neiol (ISBN-13: 9781111427429 / ISBN-10: 1111427429)

Tutorial List

Tutorial Assignment List :
Tutorial No.1 Linear Differential Equations
Problems on Differential Equations
Tutorial No.2 Fourier Transform
Problems on Fourier Transform
Tutorial No.3 Z Transform
Problems on Z Transform
Tutorial No.4 Statistics and Probability
Problems on Statics and Probability
Tutorial No.5 Numerical methods
Problems on Numerical methods
Tutorial No.6 Vector differential Calculus
Problems on Vector Diffraction.

Tutorial No.7 Vector Integral Calculus
Problems on Vector Integration
Tutorial No.8 Complex variables
Problems on Complex variables.

Text books :
1. A Text book of Applied Mathematics by P.N. Wartikar, U.N.Wartikar (Pune Vidyarthi Griha Prakashan ,Pune) (Volume II-ISBN 81-85825-07-6)((Volume III-ISBN 81-85825-01-7)
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).(*ISBN* 978-0-470-45836-5.)

Reference Books :
1) Higher Engineering Mathematics by B.S.Grewal (KhannaPublication,Delhi) (ISBN-13. 978-81-7409-195-5. *ISBN*-10. 81-7409-195-5)
2) Advanced Engineering Mathematics by Wylie C.R &Barrett L.C.(McGraw-Hill,INC)(*ISBN* 0 - 07 - 463841 – 6)
3) Advanced Engineering Mathematics by Peter V.O'Neiol
   (ISBN-13: 9781111427429 / ISBN-10: 1111427429)

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Data Structures and Files (ITUA22182)

Teaching Scheme	**Examination Scheme**
Credits: 3	Formative Assessment: 50
Lectures / Week: 3Hrs/week	Summative Assessment: 50

Pre-requisites: Fundamentals of Data Structures, Discrete Mathematics, Object oriented programming

Course Objectives :
- To study non-linear data structures and their implementations.
- To study some advanced data structures such as tables.
- 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. Use tree data structure for problem solving and programming.
2. Use graph data structure for problem solving and programming.
3. Use table data structure for problem solving and programming.
4. Illustrate heap data structure and its working.
5. Summarize different multi way trees.
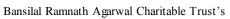6. Select appropriate file organization techniques.

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, Creation and Traversal of in-order threaded binary tree, Applications of 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 using Hashing technique

Symbol Table : Notion of Symbol Table, Static & dynamic tree table, **Hash 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: Symbol Tables using other techniques

Heap: Heap definition, Heap properties, Types of heap , Heap data structure, Applications of heap: heap sort implementation , Priority queue, Huffman algorithm, Concept of OBST , AVL Trees and algorithms

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Unit V : Multi way trees
Basic of m-way search tree, Concept of red and black trees, B tree implementation, Concept of B+ -tree, 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.

Text books :	1. Horowitz and Sahani, —Fundamentals of Data Structures in C++‖, University Press, ISBN 10: 0716782928 ISBN 13: 9780716782926. 2. R. Gillberg, B. Forouzan, —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. 2. A Michael Berman, —Data Structures via C++: Objects by Evolution‖, Oxford University Press, ISBN:0-19-510843-4. 3. M. Weiss, —Data Structures and Algorithm Analysis in C++‖, 2nd edition, Pearson Education, 2002, ISBN-81-7808-670-0. 4. Brassard & Bratley, —Fundamentals of Algorithmics‖, Prentice Hall India/Pearson Education, ISBN 13-9788120311312. 5. Goodrich, Tamassia, Goldwasser, —Data Structures and Algorithms in C++‖, Wiley publication, ISBN-978-81-265-1260-7

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Computer Networks (ITUA22183)

Teaching Scheme   **Examination Scheme**
Credits: 3   Formative Assessment: 50
Lectures / Week: 3Hrs/week   Summative Assessment: 50

Prerequisites : Digital Electronics, Fundamentals of Data Communication

Course objectives :
- To study the fundamentals of networking
- To understand functionalities of Physical and Data link layer
- To understand the functionalities of Network Layer
- To study various protocols at Transport and Application Layer
- To learn different techniques for routing and routing configuration.
- To learn and demonstrate VLAN, ACL and NAT in networking

Course Outcomes :
After completion of the course, student will be able to
1. Explore network design issues
2. Understand the functions of OSI layers & TCP/IP protocol stack
3. U nderstand the functionality of network layer
4. Understand the functionality of Transport and Application Layer
5. Analyze the routing requirements for a given network/LAN and decide the most appropriate routing strategy.
6. Design Switched networks and demonstrate the concepts of VLAN and ACL for switched networks.

Unit I – Explore the Network:

LANs, WANs, and the Internet, The Network as a Platform, Network Components, Network connecting devices, IEEE standards. Addressing: Physical &logical Addresses, Port Addresses, Specific Addresses. Rules of Communication: Communication Fundamentals, Rule Establishment, Message Encoding, Message Formatting and Encapsulation, Message Size, Message Timing, Message Delivery options.

Unit II - Network Protocols, Physical Layer and Data Link Layer

Network Protocols and Standards: Protocols, Protocol Suites, Standard Organization, Benefits of using layered Model, OSI Reference Model, TCP/IP Protocol Model, Data Transfer in the Network: Data Encapsulation and Data Access.

Physical Layer Protocols, Network Media, Data Link Layer Protocols, Media Access Control.

Types of Errors: Redundancy, Detection Versus Correction, Forward Error Correction Versus Retransmission.

Ethernet IEEE standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet.

Ethernet Protocol, LAN Switches, Address Resolution Protocol.

Unit III – Network Layer	
Network Layer Protocols, Routing, Routers, Configuring a Cisco Router. IP Addressing: IPv4 Network Addresses, IPv6 Network Addresses, Connectivity Verification. sub netting IP Networks: sub netting an IPv4 Network, Addressing Schemes, Address Schemes, Design consideration for IPv6	
Unit IV - Routing Essentials	
Introduction to Routing, Router Functions and Configuration, Routing Decisions and Operations, Routing Table, Static Routing and Default Routing, Dynamic Routing and Protocols, The Routing table, Static vs. Dynamic Routing..	
Unit V – Switched Networks	
Introduction to Switching, Switched and Converged Networks, Switching Domains, Switch Configuration and Security, Virtual LANs, Inter-VLAN Routing, Access Control Lists, NAT for IPv4.	
Unit VI – Broadband Networks	
Basic overview of various technologies : MPLS, VPN, B-ISDN, Frame Relay: Architecture and layers, ATM: Cell format, Architecture, Layers, VCC, VPC, Fast Ethernet and Gigabit Ethernet : concepts and details	

Text books :	1. S. Tanenbaum : "Computer, Networks", PHI Publication, 4th edition, ISBN: 8178087855 2. Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408 – 7 3. Kurose, Ross ―Computer Networking a Top Down Approach Featuring the Internet‖, Pearson, ISBN-10: 0132856204
Reference Books :	1.Routers and Routing Basics CCNA 2 Companion Guide- Webdell Odom, Rick McDonald 2. CCNA Routing and Switching 200-125 Official Cert. Guide Library 3. Cisco CCNA Command Guide- An introductory Guide for complete beginners

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Department of Information Technology

Software Engineering (ITUA22184)

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

Examination Scheme
Formative Assessment: 50
Summative Assessment: 50

Prerequisites : Basic programming skill

Course Objective
- To learn and understand the principles of Software Engineering
- To understand the nature of software complexity in various application domains, disciplined way of software development and software lifecycle process models.
- To introduce principles of agile software development, the SCRUM process and agile practices.
- To be acquainted with methods of capturing, specifying, visualizing and analyzing software requirements.
- To know methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and architecture.
- To apply Test Cases and Design principles to S/W project development.

Course Outcomes
After completion of the course, student will be able to
1. Compare and chose a process model for a software project development
1. Identify unique features of various software applications to write in SRS also to identify domains and classify software applications.
2. Describe principles of agile development, discuss the SCRUM process and distinguish agile process model from other process models.
3. Understand importance of risk management and configuration management & apply risk management strategies and configuration management techniques to various projects.
4. Describe project management technique & apply software testing strategies.
5. Apply advanced software engineering techniques for global software development.

Unit I - Introduction to Software Engineering

Nature of Software, The Software Process, Software Myths, A Generic Process Model, Prescriptive Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Specialized Process Models, Unified Process

Unit II - Agile Methodology

Agile Development: Agile manifesto, agility and cost of change, agility principles, myth of planned development, toolset for the agile process.
Extreme Programming: XP values, process, industrial XP, SCRUM - process flow, scrum roles, scrum cycle description, product backlog, sprint planning meeting, sprint backlog, sprint execution, daily scrum meeting, maintaining sprint backlog and burn-down chart, sprint review and retrospective.
Agile Practices: test driven development, refactoring, pair programming, continuous integration, exploratory testing versus scripted testing

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Unit III – Requirement analysis	
Requirements Capturing: requirements engineering (elicitation, specification, validation, negotiation, prioritizing requirements (Kano diagram) - real life application case study. **Requirements Analysis:** basics, scenario based modeling, UML models: use case diagram and class diagram, data modeling, data and control flow model, behavioral modeling using state diagrams - real life application case study, software Requirement Specification	
Unit IV - Risk Management , Configuration Management	
Project Risk Management: Risk Analysis & Management: Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Risks Monitoring and Management, The RMMM plan for case study project . **Software Configuration Management:** SCM basics, SCM repository, SCM process, SCM tools such as GitHub, CASE – taxonomy, tool-kits, workbenches, environments, components of CASE, categories (upper, lower and integrated CASE tools).	
Unit V – Testing & Software Quality Assurance	
Software Quality, Achieving Software Quality: Software engineering methods, Project Management techniques. Quality control and quality assurance. Software Reliability, SQA Tools, Goals and Metrics, **Introduction to Software Testing**: Principles of Testing, Testing Life Cycle, Phases of Testing, Types of Testing, Verification & Validation, Defect Management, Defect Life Cycle, Bug Reporting, GUI Testing, Test Management and Automation. **Software Process Improvement** (SPI): What is SPI, SPI Process, The CMMI, The People CMM, Case study: SPI frameworks.	
Unit VI - Advanced Software Engineering	
Maintenance & Reengineering: Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering **Emerging software engineering trends:** technology evolution, process trends, collaborative development, test-driven development, global software development challenges.	
Text books :	1. Roger S Pressman "Software Engineering : A Practitioner's Approach " 7th Edition Mcgraw- Hill ISBN:0073375977 2. Ian Sommerville " Software Engineering" 9th edition Pearson Education SBN-13: 978-0- 13-703515-1, ISBN-10: 0-13-703515-2 , pdf downloadable 3. Hong Zhu "Software Design Methodology", Elsevier ISBN: 978-81-312-0356-9
Reference Books :	1 Rajib Mall, "Fundamentals of Software Engineering", Prentice Hall India, ISBN-13: 978-8120348981 4. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer, ISBN 13: 9788173192715. 5. Joseph Phillips, IT Project Management –On Track From Start to Finish, Tata Mc Graw-Hill, ISBN13: 978-0-07106727-0, ISBN-10: 0-07-106727-2. 6. C. Michael Pilato, Ben Collins-Sussman and Brian Fitzpatrick, Version Control with subversion, O'Relly, Shroff publishers, ISBN: 978-81-8404-728-8.

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Department of Information Technology

Social Science and Engineering Economics (ES22185IT)

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

Examination Scheme
Formative Assessment: 50
Summative Assessment: 50

Prerequisites : Nil	

Course Objectives :
- 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 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. 2. Prakash, The Indian Economy, Pearson Education. 3. Thursen Gerald, Engineering Economics, Prentice Hall. 4. C.S. Rao, Environmental Pollution Control Engineering, New Age International Pvt. Ltd.
Reference books:
1. Rangarajan, Environmental Issues in India, Pearson Education. 2. University of Delhi, The Individual & Society, Pearson Education. 3. Wikipedia.org / wiki /social studies. 4. M. N. Srinivas, Social change in modern India, 1991, Orient Longman. 5. David Mandelbaum, Society in India, 1990, Popular

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Lab Practice II (ITUA22186)

Teaching Scheme :   **Examination Scheme**
Credits: 3   Formative Assessment: 50
Lectures / Week: 6Hrs/week   Summative Assessment: 50

Course objectives :
- To understand various network command and configuration of network equipment's   - To understand various network application protocols   - To study non-linear data structures and their implementations.   - To study some advanced data structures such tables.   - 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. Know various commands and utilities related to networking 2. Configure various application protocols on the server and check them through clients 3. Use tree data structure for problem solving and programming. (Application) 4. Use graph data structure for problem solving and programming. (Application) 5. Use table data structure for problem solving and programming. (Application) 6. Illustrate heap data structure and its working. (Application)

	PART I- Computer Network Laboratory
1	Study of basic TCP/IP network commands and utilities (eg: ping, ifconfig, tracert, arp, tcpdump, whois, host, netsat, nslookup, ftp, telnet etc…)
2	Configure a router (Ethernet & Serial Interface) using router commands including access lists on any network simulator (eg. Packet Tracer)
3	Network design and implementation for small network using Packet Tracer
4	Network design & implementation of VLAN on Packet Tracer
5	Network analysis as well as packet header study with the help of any protocol analyzer/ packet sniffer.(eg: wireshark)
6	Socket Programming in C Language on Linux. a) TCP Client , TCP Server b) UDP Client , UDP Server
7	Installation and Configuration of Remote Login Service Telnet/SSH and access it through Telnet/SSH client
8	Installation and Configuration of FTP server and access it through FTP Client

9	Installation and configuration of DHCP Server in Wireless Environment using an Access Point (Packet Tracer)
10	Case Study of existing College network with IP Address Scheme.
PART II- Data Structure and Files Laboratory	
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) Create a binary search tree (BST) of and perform following operations: i) Insert ii) Display inorder iii) Search a node
	b) Perform following operations on BST ii) Find height of the tree iv) level wise display
	c) Perform following operations on BST i) Delete iii) Find mirror image
3	a) Construct an inorder threaded binary search tree.
	b) Traverse threaded binary tree it in inorder and preorder.
4	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. i) Find who is having maximum friends Hint: Use adjacency list representation
	b) For a friends' network, ii) Find who has post maximum and minimum comments (using BFS) iii) Find users having birthday in this month (using DFS)
5	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.
6	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. i) Represent using appropriate data structure.
	b) Apply suitable algorithm to find minimum total cost. (Prim's algorithm)
7	a) Represent any real world graph using adjacency list /adjacency matrix
	b) Find minimum spanning tree using Kruskal's algorithm.
8	a) Store data of students using hashing function for roll number and implement linear probing using chaining without replacement algorithm.

	b) Store data of students using hashing function for telephone number and implement linear probing using chaining with replacement algorithm.
9	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.
10	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 iv) Delete a record v)Modify a record.
11	a) Implement direct access file for any Database and perform following operations on it i) Create Database ii) Display Database
	b) For direct access file perform iii) Search a record
	*All assignments to be implemented using C/C++ on Linux platform.

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

IT Workshop in Java (ITUA22187)

Teaching Scheme	Examination Scheme
Credits: 3	Formative Assessment: 100
Lectures / Week: 2Hrs/week	Summative Assessment: NA
Practical's / Week: 2Hrs/week	

Prerequisites : Data Structure and Files, Object Oriented Programming, Basic knowledge of database management system

Course objectives :
- To learn and understand fundamentals object oriented programming using core java
- To learn and understand client side programming of a small project.
- To learn and understand server side programming of a small project.

Course Outcomes

After completion of the course, student will be able to
1. Apply fundamental concepts Object Oriented programming in Core Java.
2. Design and Develop the user interface and validate it.
3. Develop server side programming skills and database handling.

Unit I – Introduction to the Java Environment and Java

Installing Java, Java Program Development, Class Fundamentals , Object & Object reference , Object Life time & Garbage Collection, Constructor, Access Control, Modifiers, methods Nested , ,Abstract Class & Interfaces, Method Overloading, Dealing with Static Members, Array, Inheritance, Polymorphism in inheritance.

Unit II - GUI Programming in Java

Introduction to HTML, List, Creating table, Linking documents, Frames, style sheet and Introduction JavaScript, Advantage of java script, Java script syntax, Data type- Variable, Array, Operator and Expression looping constructor, Function, Dialog box, Java script document object model, Introduction object in HTML, Event handling, Window object, Document object, Browser object, Form object, Navigator object, Screen object, Built in object, User defined object, Cookies

Unit III - Database Programming and Java Server Technologies

Database Programming using JDBC Introduction to JDBC,JDBC Drivers & Architecture, CURD operation Using JDBC

Servlet Web Application Basics, Architecture and challenges of Web Application, Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment , Descriptor (web.xml), Handling Request and Response, JSP
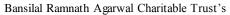
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Department of Information Technology

Text books :	1. Jeff Friessen, "Beginning java 6 platform from Novice to Professional", Apress/Springer, 9788181288769 2. Kogent Learning Solutions Inc, "Web Engineering: HTML ,Javascript, PHP, Java, JSP, ASP.net, XML and Ajax", Wiley Black Book, 9788177229974 3. Gallardo, Burnette, McGrovern ," Eclipse in action: a guide for java Developers", Manning, 9788177224986
Reference Books :	5. Khalid A Mughal, "A programmer's guide to Java SCJP Certification", Third Edition, Pearson Education ,978-81-317-2688-4

Lab Assignments:

Prerequisites : Data Structure and Files, Object Oriented Programming, Basic knowledge of database management system

Course objectives :
- To learn and understand fundamentals object oriented programming using core java
- To learn and understand client side programming of a small project.
- To learn and understand server side programming of a small project.

Course Outcomes

After completion of the course, student will be able to
1. Apply fundamental concepts Object Oriented programming in Core Java.
2. Design and Develop the user interface and validate it.
3. Develop server side programming skills and database handling.

Assignment 1-Core Java Programming

Develop mini-project in Core Java using any IDE.

Following points should be covered

1. Object oriented programming Principle.

2. Effective Use of IDE and customization to improve productivity and accuracy.

3. add Set/ Get Methods,

4. Overriding methods from base class

5. Add constructors

6. Customization, commenting javadoc etc.

Assignment 2- Client Side Technologies

1.Develop User interface using HTML and client side scripting JavaScript and simple Applets.

2.Focus on changing the behavior of the pages and Form Validations through Client side scripting.

For this, reuse the mini project developed in core java in Unit I

Assignment 3– Server side Programming

1.Develop a Server side mini-project using Servlets. Preferably this mini-project should reuse the part of the mini project developed for Unit-I and Unit-II.

Focus in this mini-project should be to understand

1. How to use an IDE environment for web application development

2. How to use tomcat through an IDE for running web applications.

3. HTTPRequest, HTTPResponse, Session etc.

4. Data persistence through JDBC

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Cyber Security (ITUA22188)

Teaching Scheme	Examination Scheme
Credits: 2	Formative Assessment: 100
Lectures / Week: 2Hrs/week	Summative Assessment: NA

Prerequisites : NIL

Course objectives :
- To understand the importance of cyber security
- To know various laws and codes of ethics of information security
- To know different types of cyber-attacks and related tools to overcome it
- To know the issues related to cyber forensics

Course Outcomes

After completion of the course, student will be able to
1. Summarize various issues in cyber security
2. Explain applicable laws and codes of ethics in information security
3. Distinguish various tools used in preventing cyber attacks
4. Understand cyber forensics issues

Unit I – Introduction to Cyber Security

Definition and origin, Cyber Crime and information security , Classification of Cyber Crime, The Legal Perspective-Indian/Global Perspective , Categories of Cyber Crime, Types of Attack , Social Engineering, Cyberstalking , Cyber Crime, Cloud Computing.

Unit II - Legal, Ethical Issues in Information security Risk Management

Overview, Risk identification (Vulnerability Scanning) , Risk assessment (Vulnerability Assessment) , Risk control strategies (Penetration Testing), Quantitative vs Qualitative , Risk control practice, Risk management, Law and ethics in information security , Code of ethics, Protecting programs and data.

Unit III - Tools and Methods used in Cyber Crime

Introduction, Proxy server and anonymizers , Phishing password cracking, Key logger and spyware, Types of virus- worms, DoS and DDoS, SQL Injection, Cyber Crime and Legal perspective, Cyber law – Indian Context, The Indian act-amendments, challenges to India law and cybercrime scenario in India, Indian IT act, Digital signature.

Unit IV :Cyber Forensics

Introduction to Cyber forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information hiding, Scrutinized E-mail, Validating E-mail header information, Tracking Internet access, Tracing memory in real-time.

Text books :	Nima Godbole, Sunit Belapure, Cyber Security- Understand Cyber Crimes, Computer Forensics and Legal Perspectives, Wiely India Pvt. Ltd, ISBN- 978-81-265-2179-1