VASAVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

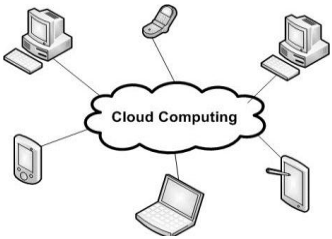
IBRAHIMBAGH, HYDERABAD-500 031

ACCREDITED BY NAAC WITH A++ GRADE

Approved by A.I.C.T.E., New Delhi and
Affiliated to Osmania University, Hyderabad-07

Sponsored by
VASAVI ACADEMY OF EDUCATION
Hyderabad

SCHEME OF INSTRUCTION AND SYLLABI UNDER CBCS FOR
B.E. (IT) III and IV Semesters with effect from 2025-2026
(For the batch admitted in 2024-25)
(R-24)



DEPARTMENT OF INFORMATION TECHNOLOGY

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

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IBRAHIMBAGH, HYDERABAD-500 031

Vision

Striving for a symbiosis of technological excellence and human values.

Mission

To arm young brains with competitive technology and nurture holistic development of the individuals for a better tomorrow.

Quality Policy

Education without quality is like a flower without fragrance. It is our earnest resolve to strive towards imparting high standards of teaching, training and developing human resources.

DEPARTMENT OF INFORMATION TECHNOLOGY

Vision

To be a center of excellence in the emerging areas of Information Technology.

Mission

- Provide a comprehensive learning experience on the latest technologies and applications.
- Equip the stakeholders with latest technical knowledge and leadership skills with collaboration to become competent professionals.
- Motivate innovation and contribute to the societal issues with human values and professional ethics.

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Programme Educational Objectives (PEOs) for IT Program

A Graduate of Information Technology will be able to:

PEO1: Pursue higher studies in multidisciplinary areas with research orientation.

PEO2: Develop core IT competencies aligned with emerging industry trends to become global leaders with ethical values.

PEO3: Engage in continuous learning and address the societal problems with sustainable solutions.

Program Specific Outcomes (PSOs) for IT Program

Our students, upon graduation from the program, will be able to:

PSO1: Identify and develop software solutions using programming languages, tools and AI/ML concepts.

PSO2: Design, develop and maintain secure stand-alone, embedded and networked systems.

PSO3: Analyze the architectures of autonomous or semi-autonomous intelligent systems and apply to real-time scenarios.

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Program Outcomes (POs) for IT Program

At the end of the program, the graduates will demonstrate

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, societal, 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.

PROMOTION RULES

1. Attendance and Sessional marks requirements:

1	B.E(4yrs)	**Attendance:** Minimum aggregate attendance required to eligible to attend semester end exams is 75% and 65% with Medical Condonation respectively.
		Sessional Marks: Minimum aggregate of sessional marks required to become eligible for appearing semester end examinations is 40%

II. Promotion rules for B.E(4YDC) course

S No	Semester/Class	Conditions to be fulfilled
1	I-SEM TO II- SEM	Regular course of study of I-SEM and 40% aggregate CIE marks in I-SEM
2	II-SEM TO III SEM	a. Regular course of study of II SEM and b. 40% aggregate CIE marks in II-SEM c. Must have secured at least 50% of total credits prescribed for I and II SEMs together
3	III-SEM to IV-SEM	a. Regular course of study of III-SEM and b. 40% aggregate CIE marks in III-SEM
4	IV-SEM to V-SEM	a. Regular course of study of IV SEM b. 40% aggregate CIE marks in IV-SEM c. Passed in all the courses of I and II SEMs d. Must have secured at lest 50% of total credits prescribed for III and IV SEMs put together
5	V-SEM to VI-SEM	a) Regular course of study V-SEM b) 40% aggregate CIE marks in V-SEM
6	VI-SEM to VII-SEM	a. Regular course of study of VI SEM b. 40% aggregate CIE marks in VI-SEM c. Passed in all the courses of III and IV SEMs d. Must have secured at least 50% of total credits prescribed for V and VI SEMs put together
7	VII-SEM to VIII-SEM	a. Regular course of study of VII SEM b. 40% aggregate CIE marks in VII SEM
8	Eligibility to appear VIII-SEM exams	a. Regular course of study of VIII SEM and 40% aggregate CIE marks in VIII-SEM

III. Promotion rules for B.E(3 YDC) course (Lateral Entry)

S No	Semester/Class	Conditions to be fulfilled
1	III-SEM to IV-SEM	a. Regular course of study of III-SEM and
		a. 40% aggregate CIE marks in III-SEM
2	IV-SEM to V-SEM	e. Regular course of study of IV SEM
		f. 40% aggregate CIE marks in IV-SEM
		g. Must have secured at lest 50% of total credits prescribed for III and IV SEMs put together
3	V-SEM to VI-SEM	c) Regular course of study V-SEM d) 40% aggregate CIE marks in V-SEM
4	VI-SEM to VII-SEM	e. Regular course of study of VI SEM
		f. 40% aggregate CIE marks in VI-SEM
		g. Passed in all the courses of III and IV SEMs
		h. Must have secured at least 50% of total credits prescribed for V and VI SEMs put together
5	VII-SEM to VIII-SEM	c. Regular course of study of VII SEM d. 40% aggregate CIE marks in VII SEM
6	Eligibility to appear VIII-SEM exams	b. Regular course of study of VIII SEM and 40% aggregate CIE marks in VIII-SEM

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-24)
B.E. – INFORMATION TECHNOLOGY : THIRD SEMESTER (2025 - 2026)

B.E (IT) III-Semester								
Course Code	**Course Name**	**Scheme of Instruction**			**Scheme of Examination**			
		Hours per week			**Duration in Hrs**	**Maximum Marks**		**Credits**
		L	**T**	**P/D**		**SEE**	**CIE**	
U24BS330MA	Discrete Mathematics	3	1	-	3	60	40	**4**
U24ES310IT	Digital Electronics & Logic Design	3	-	-	3	60	40	**3**
U24PC310IT	Data Structures	3	-	-	3	60	40	**3**
U24PC320IT	Object Oriented Programming	3	-	-	3	60	40	**3**
U24OE3XXXX	Open Elective – I	2	-	-	3	60	40	**2**
U25HS310EH	**Critical Thinking**	1	-	-	2	40	30	**1**
U24HS320EH	Skill Development Course - I (Communication Skills in English–I)	1	-	-	2	40	30	**1**
U24PE310IT	Skill Development Course – II (Technical Skills- I)	1	-	-	2	40	30	**1**
PRACTICALS								
U24PC311IT	Data Structures Lab	-	-	2	3	50	30	**1**
U24PC321IT	Object Oriented Programming Lab	-	-	2	3	50	30	**1**
U24PC331IT	Network Engineering Lab	-	-	2	3	50	30	**1**
	Extra-Curricular Activities-I	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Library / Sports / Mentor Interaction	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Student should acquire one NPTEL Certification Course equivalent to 2 credits (8 weeks) by the end of VI Semester. • Students opting for Honours should complete one NPTEL Course of 2 credits (8 Weeks) by the end of IV Semester.								
	Total	**17**	**1**	**6**	**-**	**570**	**380**	**21**
	Grand Total	**18 + 6 = 24**			**--**	**950**		

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Accredited by NAAC with A++ Grade
9-5-81, Ibrahimbagh, Hyderbad-500031, Telangana State
DEPARTMENT OF MATHEMATICS

DISCRETE MATHEMATICS

For B.E., III- Sem., (CBCS)
(For IT Branch only)

L:T:P (Hrs./week): 3:1:0	SEE Marks :60	**Subject Reference Code: U24BS330MA**
Credits : 4	CIE Marks :40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to :	***At the end of the course students should be able to:***
1. Understand* the Propositions and their equivalences, predicates and quantifiers and learn various proof strategies.** ***2. Learn* the basics of counting, combinatorics and various methods of solving Recurrence relations.** ***3. Study the concept of relations, including their properties and representations, equivalence relations, Posets, Hasse diagrams, maximal and minimal elements **4. *Understand*** the fundamentals of graph theory, graph isomorphism, and connectivity. **5. *Understand*** the advanced topics in graph theory, graph colouring, and applications of graph colouring.	**1. *Use* the** logical **notation** to define and reason about **fundamental mathematical concepts and synthesize induction hypothesis and simple Induction proofs**. **2. *Apply*** the basic principles of counting to solve combinatorial problems and solve recurrence relations, both linear homogeneous and non-homogeneous, using various techniques. **3. *Identify*** various types of relations, represent relations using matrices and graphs, construct Hasse diagrams for Posets, determine maximal and minimal elements in a Poset. **4. *Apply*** graph terminology to describe the structure of graphs and determine graph isomorphism. **5. *Determine*** the existence of Eulerian and Hamiltonian paths, and the chromatic number of a graph using various techniques of graph colouring.

UNIT – I : LOGIC: Logic- Logical connectives- Propositional equivalences– Predicates and quantifiers.
MATHEMATICAL REASONING, INDUCTION: Proof Strategy- Methods of Proofs- Mathematical Induction.

UNIT – II : COUNTING: Basics of counting- Pigeonhole principle – Permutations & Combinations- Pascal's Identity- Vandermonde's Identity.

ADVANCED COUNTING TECHNIQUES: Recurrence relations: Solving Recurrence Relations- Linear Homogeneous and Non-Homogeneous Recurrence relations.

UNIT – III : RELATIONS: Relations – Properties -Representing relations - Equivalence Relations - Partial Orderings- Poset- Hasse diagrams – Maximal & Minimal Elements.

UNIT –IV : GRAPH THEORY-I: Introduction - Graph Terminology - Types of graphs - Basic theorems - Representing Graphs and Graph Isomorphism – Connectivity.

UNIT –V (8 Hours)
GRAPH THEORY-II:
Euler and Hamiltonian paths – Shortest path problems - Dijkstra's algorithm - Planar graphs- Euler's Formula.

Text Books:

1. Kenneth H. Rosen – Discrete Mathematics and its application – 5th edition, Mc Graw – Hill, 2003.
2. Joel. Mott. Abraham Kandel, T.P. Baker, Discrete Mathematics for Computer Scientist &Mathematicians, Prentiee Hail N.J., 2nd edn, 1986.

Reference Books:

1. Discrete and Combinatorial Mathematics by Ralph P. Grimaldi, Pearson International
2. J.P.Trembly, R.Manohar, Discrete Mathematical Structure with Application to Computer Science, Mc Graw- Hill – 1997.
3. R.K. Bisht, H.S.Dhami - Discrete Mathematics, Oxford University Press, 2015.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc24_cs58/preview
2. https://onlinecourses.swayam2.ac.in/cec24_ma18/preview

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests **: 90 Minutes**

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IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

DIGITAL ELECTRONICS AND LOGIC DESIGN

SYLLABUS FOR III-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks :60	Course Code : **U24ES310IT**
Credits : 3	CIE Marks :40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The Objectives of the course:	*On completion of the course, students will be able to:*
1. Introduce the concepts of combinational and sequential circuit design. 2. Introduce VHDL Programming Language to implement digital circuits.	1. Simplify Boolean Functions using algebraic and K-map techniques to specific number of literals. 2. Design combinational circuits using fundamental logic gates and programmable logic devices for a given problem. 3. Draw the circuits of different types of flipflops and explain their operation using Truth tables and excitation tables. 4. Analyze any given synchronous or asynchronous sequential circuit and design synchronous or asynchronous sequential circuits for a given specification of the problem. 5. Implement combinational and sequential circuits using VHDL programming language.

UNIT – I:

Introduction to Boolean algebra and number system, Logic Gates, Optimized implementation of logic functions – Karnaugh Map, Strategies for minimization of product-of-sum and sum-of-product functions. Multiple output circuits. NAND and NOR logic networks, Cost functions, Introduction to CAD tools and VHDL

UNIT – II:

Combinational circuit building blocks – Multiplexers. Decoders. Encoders. Code converters, Arithmetic comparison circuits. General structures of a PLA, gate level diagram, schematic diagram, PAL. Structure of CPLDs and FPGAs, 2-input and 3-input lookup tables(LUT). Design of Arithmetic-circuits using CAD tools. VHDL for Combinational circuits

UNIT – III:

Basic Latch, Gated SR Latch, gated D Latch, T Flip-flop, JK Flip-flop, excitation tables. Master-Slave edge triggered flip-flops. Set up and hold time of a flip-flop. Registers, Counter. Using registers and counters with CAD tools. Design examples using VHDL.

UNIT – IV:

Synchronous Sequential Circuits – Analysis of Synchronous sequential Circuits Basic design steps. State-Assignment problem Moore and Mealy state models. State minimization, Design of FSM with CAD Tools. Implementation using VHDL.

UNIT – V:

Introduction to Asynchronous sequential circuits, Analysis of Asynchronous sequential circuits. Hazards: static and dynamic hazards. Significance of Hazards. Clock skew, ASM Charts, Digital Hardware Design Flow.

Learning Resources :

1. M. Moris Mano, Charles R. Kime, Logic and Computer Design Fundamentals, 2nd edition, Pearson Education Asia, 2001.
2. Stephen Brown , Zvonko Vranesic – Fundamentals of Digital Logic with VHDL design, McGraw Hill – 2000.
3. Virendrakumar Digital ElectronicsTheory& Experiments, New Age International Publishers, 2002
4. John F. Walkerly, Digital Design : Principles and Practices, Pearson India, 4th Edition.
5. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Digital Systems: Principles and Applications, Pearson India, 10th Edition.
6. https://nptel.ac.in/courses/117106086/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests **: 90 Minutes**

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA STRUCTURES

SYLLABUS FOR III-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks :60	Course Code : **U24PC310IT**
Credits : 3	CIE Marks :40	Duration of SEE : 3 Hours

Course Objectives	Course Outcomes
The Objectives of the course:	*On completion of the course, students will be able to:*
1. Demonstrate linear and non-linear data structures and their applications. 2. Illustrate searching and sorting techniques.	1. Understand asymptotic notations, operations on arrays and stacks, and evaluate arithmetic expressions. 2. Analyze search, insert and delete operations on queues and linked list. 3. Compare complexities of insertion, deletion and search operations on trees, binary search trees and balanced binary search trees. 4. Understand the operations on multiway search trees and apply graph search algorithms to find minimal cost Spanning trees. 5. Evaluate the complexities of sorting, searching and hashing techniques.

UNIT-I:

Basic Concepts: Elementary Data Organizations, Data Abstraction. Data Structures Introduction and Operations: insertion, deletion, traversal. Performance analysis - time complexity and space complexity, Asymptotic Notations- Big O, Omega and Theta notations.

Arrays: Arrays – ADT, Polymonials, Sparse matrices, Strings-ADT, Pattern Matching

Stacks: Stack Abstract Data Type, Representation of a Stack using Arrays – Implementation of Stack Operations - Stack Applications: Infix to postfix Transformation - Evaluating Arithmetic Expressions.

UNIT-II:

Queues: Queue Abstract Data Type- Representation of a Queue using array - Implementation of Queue Operations - Applications of Queues - Circular Queues.

Linked List: Introduction – Singly Linked list -Operations on a singly linked list -Dynamically Linked Stacks and Queues Doubly linked list-Operations on a doubly linked list, Circular Linked list, Polynomial manipulation - Operations, Sparse Matrices.

UNIT-III:

Trees: Introduction, Binary Trees, Binary Tree Traversals, Priority Queues, Heaps.
Binary Search trees (BST) : Definition, Searching a BST, Insertion into a BST, Deletion from a BST.
Efficient Binary Search Trees: AVL Trees, Red-Black Trees, Splay Trees.

UNIT-IV:

Multiway Search Trees: m-way search trees-Definition and Properties, Searching an m-way search tree, B-Trees-Definition and properties, Number of Elements in a B-Tree, Insertion into a B-Tree and Deletion from a B-Tree.
Trie Data Structure : Introduction, Basic Operations
Graphs: The Graph ADT, Elementary graph operations - Depth First Search (DFS), Breadth First Search (BFS), Minimal Cost Spanning Trees- Kruskal's Algorithm, Prim's Algorithm.

UNIT-V:

Sorting and complexity analysis: Heap Sort, Topological Sort
Searching: Linear Search, Binary Search Techniques and their complexity analysis.
Hashing : Introduction, Static Hashing – Hash tables, Hash functions, Overflow handling.

Learning Resources:

1. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, 2/e, Universities Press, 2008
2. Mark A Weiss, Data Structures and Algorithm Analysis In C, Second Edition (2002), Pearson
3. Richard F, Gilberg, B.A. Forouzan, "Data Structures, A Pseudocode Approach with C", Cengage, 2nd Edition
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stem 'Introduction to Algorithms' 2002.
5. Tanenbaum A. M , Langsam Y. Augenstein M. J, Data Structures using C, Second Edition (2008), Pearson
6. Data Structures through C in depth,S K Srivastava,Deepali Srivastava,BPB publications,2nd Edition
7. http://nptel.ac.in/courses/106106127/
8. http://nptel.ac.in/courses/106103069/
9. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/lecture-videos/

The break-up of CIE: Internal Tests + Assignments + Quizzes

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DEPARTMENT OF INFORMATION TECHNOLOGY

OBJECT ORIENTED PROGRAMMING

SYLLABUS FOR B.E. III-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code : **U24PC320IT**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVE	COURSE OUTCOMES
The Objectives of the course:	*On completion of the course, students will be able to:*
1. Provide an overview of object-oriented programming concepts. 2. Explore java libraries to build applications.	1. Illustrate object-oriented programming features using Java. 2. Perform exception handling and multithreading. 3. Perform I/O operations, String manipulation using java libraries. 4. Implement data structures using collections framework. 5. Design and develop GUI using java libraries.

UNIT-I

Object Oriented Programming Fundamentals :
Object, Class, Abstraction, Encapsulation, Inheritance, Polymorphism.

Java Programming Fundamentals: Overview of Java , Java-keywords, Data types, Variables, Arrays, Command Line Arguments, Operators, Control statements, Structure of a Java class, Classes, Methods, Abstract Classes, Nested Classes. **Interfaces :** Defining interfaces, extending interfaces, implementing interfaces. Lambda expression fundamentals, Functional Interfaces, Examples of Lambda expressions. **Packages**: Creation, importing a package and user defined package.

UNIT-II

Exception Handling: Introduction, types of exceptions, syntax of exception handling code, multiple catch statements, using finally statement, user-defined exceptions.

Multithreaded Programming: Introduction to threads, creating threads, extending the Thread class, implementing the Runnable interface, life cycle of a thread, priority of a thread, synchronization, and Inter-thread Communication.

UNIT-III

Exploring java.io : Java I/O classes and interfaces, Files, Character, and Byte Streams Serialization.

Exploring java.lang: Object, Wrapper classes, String, StringBuffer, System.

Exploring java.util: Scanner, StringTokenizer; regular expression processing using java.util.regex; **Exploring java.time**: date and time API

UNIT-IV

Introduction to Generics: Defining Generics, Generics and Subtyping, Wildcards, Generic Methods.

Introduction to Collections: Collection Framework, Benefits of Collections Framework, Collection Framework Interfaces : Collection , Set, List, Queue, Deque, Sorted Set, Map, Sorted Map. Collection Framework Implementations : HashSet, TreeSet, ArrayList, LinkedList, PriorityQueue, ArrayDeque, HashMap, TreeMap. Traversing Collections. Collection Framework Algorithms : Sorting, Searching.

UNIT-V

GUI Programming : Introduction to Abstract Window Toolkit(AWT), Swing Class Hierarchy, Swing Components, Containers, Layout Managers, Event Handling : The Delegation Event Model, Model View Controller Architecture, Modifying Look and Feel.

Introducing JavaFX for GUI programming, exploring JavaFX Controls, introducing JavaFX Menus.

Learning Resources:

1. Herbert Schildt, The Complete Reference Java, 9th Edition, Tata McGraw Hill Education,2014.
2. Nell Dale, Chip Weems, Programming and Problem solving with JAVA, Jones and Bartlett Publisher, 2004.
3. C Thomas Wu, An Introduction to Object Oriented Programming with Java, 5th edition, McGraw Hill Publishing, 2010.
4. Y. Daniel Liang , An Introduction to JAVA Programming, Tata McGraw Hill, 2009.
5. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2012.
6. https://nptel.ac.in/courses/106105191/
7. https://docs.oracle.com/javase/tutorial/

The break-up of CIE : Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

CRITICAL THINKING

SYLLABUS FOR B.E. 2/4 – III & IV SEMESTERS

L:T:P (Hrs./week): 1:0:0	SEE: 40	Course code: **U25HS310EH**
Credits: 1	CIE: 30	Duration of SEE: 2 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the learners to:	**At the end of the course the learners will be able to: -**
1. Understand the basics of logic, reasoning, and identifying biases. 2. Learn to evaluate evidence and differentiate between facts and opinions. 3. Introduce frameworks like SWOT and root cause analysis for problem-solving. 4. Develop critical thinking skills through case studies and ethical debates.	1. Students will identify assumptions, biases, and logical fallacies in real-world scenarios. 2. Learn to evaluate evidence and differentiate between facts and opinions. 3. Students will apply structured methods to analyze problems and propose actionable solutions. 4. Students will demonstrate critical thinking through group discussions and case study analyses.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3										
CO2				3								
CO3			3									
CO4												3

Summary (CO to PO Contribution)

CO1:Identify assumptions, biases, and logical fallacies in real-world scenarios.

CO2:Evaluate evidence and differentiate between facts and opinions.

CO3:Apply structured methods to analyze problems and propose actionable solutions.

CO4:Demonstrate critical thinking through group discussions and case study analyses.

OVERVIEW:
In a world where automation and AI are rapidly transforming the workforce, critical thinking has become a vital human skill that sets professionals apart. This course empowers engineering students to think independently, evaluate information logically, and make well-reasoned decisions. Through engaging with real-world problems, ethical dilemmas, and structured problem-solving tools, students will develop the ability to question intelligently, respond thoughtfully, and contribute meaningfully in AI-assisted environments.

UNIT 1: Fundamentals of Critical Thinking
Introduces the foundations of logical thinking and the importance of recognizing faulty reasoning.

1.1 Logic and Reasoning
1.2 Identifying Assumptions
1.3 Bias and Fallacies

Learning Outcomes:

- Understand and apply the basics of logical thinking and structured reasoning
- Identify personal and systemic assumptions in real-world and technical contexts
- Detect common biases and fallacies in digital content and AI-generated outputs

UNIT 2: Analytical Thinking
Equips students to analyze information critically and draw conclusions based on solid evidence.

2.1 Evaluating Evidence
2.2 Drawing Logical Conclusions
2.3 Differentiating Facts from Opinions

Learning Outcomes:

- Evaluate the reliability and relevance of data from human and AI sources
- Draw logical conclusions from complex and sometimes incomplete datasets
- Differentiate between subjective opinions and objective, verifiable information

UNIT 3: Problem-Solving Frameworks
Builds practical decision-making skills using structured, human-driven analytical tools.

3.1 Root Cause Analysis (5 Whys)
3.2 Decision Trees
3.3 SWOT Analysis

Learning Outcomes:

- Break down problems systematically to identify core issues beyond surface symptoms
- Use structured tools to support decision-making in multidisciplinary and tech-enabled environments
- Integrate strategic thinking with ethical judgment when proposing solutions

UNIT 4: Applications of Critical Thinking

Applies critical thinking to real-life contexts through discussions, debates, and case studies.

4.1 Case Studies
4.2 Group Discussions on Ethical Dilemmas
4.3 Critical Thinking in Action: Debating Complex Engineering Issues

Learning Outcomes:

- Apply critical thinking to analyze real-world problems in engineering, business, and society
- Collaborate effectively and respectfully in group settings, including diverse viewpoints
- Demonstrate ethical reasoning and informed argumentation in AI-influenced scenarios

ADDITONAL READING:

- Martha Nussbaum Not for Profit: Why Democracy Needs the Humanities (2010).
- The Invisible Man : Ralph Ellison
- Thinking, Fast and Slow by Daniel Kahneman
- The McKinsey Mind: Understanding and Implementing the Problem-Solving Tools and Management Techniques of the World's Top Strategic Consulting Firm by Ethan M. Rasiel and Paul N. Friga

LEARNING RESOURCES

learn.talentsprint.com

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal tests	:	1	Max. Marks	:	20
2	No. of assignments	:	1	Max. Marks	:	5
3	No. of Quizzes	:	1	Max. Marks	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

SKILL DEVELOPMENT COURSE-I -COMMUNICATION SKILLS IN ENGLISH-I

(Common to all branches)

SYLLABUS FOR B.E. -III SEMESTER

L:T:P (Hrs./week): 1:0:0	SEE: 40	Course code: **U24HS320EH**
Credits : 1	CIE: 30	Duration of SEE: 2 Hours

COURSE OBJECTIVES The course will enable the learners to:	**COURSE OUTCOMES** At the end of the course the learners will be able to: -
COURSE OBJECTIVES **The course will enable the learners to:** 1. Get students proficient in both receptive and productive skills especially 2. Enable students to understand the importance and method of exchanging information in a formal space- both written and spoken 3. Introduce students to an ideal structure for a presentation and discussion- individually and in groups 4. Develop and improve reading skills needed for college work and reproduce the content based on the situational need.	**COURSE OUTCOMES** **At the end of the course the learners will be able to:** 1. Introduce themselves effectively and converse in a formal environment especially in the online space 2. Write emails with appropriate structure and content 3. Use appropriate structure based on the content employing appropriate transitions in written and spoken communication 4. Paraphrase and Summarise in Spoken and written formats

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1										3		
CO2										3		
CO3												3
CO4												3
CO5												
CO6												

Summary (CO to PO Contribution)

CO1:Introduce themselves effectively and converse in a formal environment especially in the online space

CO2:Write emails with appropriate structure and content.

CO3: Use appropriate structure based on the content employing appropriate transitions in written and spoken communication

CO4: Paraphrase and Summarise in Spoken and written formats

Unit 1: Delightful Descriptions

Participants learn to introduce themselves confidently, make detailed observations, express opinions, and describe past experiences effectively in various contexts.

1.1 Introductions on an Online Forum
1.2 Making Observations and Giving Opinion
1.3 Recalling and Describing

Unit 2: Formal Conversation Skills

Focuses on essential professional communication skills such as seeking and providing information, giving constructive feedback, and politely requesting permissions in formal settings.

2.1 Ask for Information
2.2 Give Information
2.3 Give Feedback
2.4 Seek Permission

Unit 3: Technical Expositions and Discussions

Develops skills to present and discuss technical content logically using structures like classification, sequencing, comparison, cause-effect relationships, and problem-solution formats.

3.1 Classification
3.2 Sequence
3.3 Compare and Contrast
3.4 Cause and Effect
3.5 Problem and solution

Unit 4: Rational Recap

Enhances clarity in communication through accurate paraphrasing and summarizing, both in spoken and written forms, ensuring message retention and understanding.

4.1 Paraphrasing - Written
4.2 Summarizing - Written
4.3 Paraphrasing – Spoken
4.4 Summarizing – Spoken

METHODOLOGY	**ASSESSMENTS**
- Case Studies	- Online assignments
- Demonstration	- Individual and Group
- Presentations	
- Expert lectures	
- Writing and Audio-visual lessons	

Learning Resources:

They Say / I Say: The Moves That Matter in Academic Writing" – Gerald Graff & Cathy Birkenstein
HBR Guide to Persuasive Presentations" – Harvard Business Review
Technical Communication" – Mike Markel & Stuart Selber
The Only Academic Phrasebook You'll Ever Need" – Luiz Otávio Barros
learn.talentsprint.com

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal tests	:	2	Max. Marks	:	20
2	No. of assignments	:	2	Max. Marks	:	5
3	No. of Quizzes	:	2	Max. Marks	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

SKILL DEVELOPMENT COURSE-II -TECHNICAL SKILLS-I

SYLLABUS FOR B.E. III-SEMESTER

L:T:P (Hrs./week): 1:0:0	SEE Marks : 40	Course Code : **U24PE310IT**
Credits : 2	CIE Marks : 30	Duration of SEE : 2 Hours

COURSE OBJECTIVE The course will enable the students to	**COURSE OUTCOMES** *On completion of the course, students will be able to*
❖ Understand the significance of Competitive Coding ❖ Prepare the students for the contests relative to the concepts learnt ❖ Build confidence in coding using Linear Data structures ❖ Learn essential algorithms for Competitive Coding	❖ Solve scenario based problems on linked lists, Recursive Algorithms, Search & Sort Algorithms, Divide & Conquer Strategies and use memory manipulation functions. ❖ Learn linear data structures usage in various applications with scenario based problem solving through coding

Phase I

#1: Code Complexity Analysis & Linear List data

Problem solving through Coding, Compare and contrast coding and competitivecoding, Various approaches for problem solving, techniques for competitive coding, Orientation on Competitive coding on coding platforms like Codechef/ Codeforces/ Leetcode/ Hackerrank etc

Precise coding techniques implementing the evaluation of the language supported expressions, code complexity analysis, Linear/ Logarithmic/ Super linear/ Polynomial/ Exponential/ Recursion Algorithm analysis, Problem Solvingusing Linear list data, Subscripts, 2D Array Subscript, RMO & CMO Representation, Matrix Problems. Company Specific Examples & Competitive Programming Practice Problems.

Contextual implementation using Competitive Coding using global coding platforms: Code chef/ Leet code / Codeforces / Hackerrank etc

#2: Memory Manipulation Methods and Problem Solving on String data

Pointer Variable, Pointer Arithmetic, Memory Layout, Runtime memory allocation, Problem Solving on String Data, String handling methods, Examples, Practice Problems

#3: Problem Solving using Linked List data

Implementing a Structure member pointer reference, Coding solutions for Linked list manipulation, Solutions for order statistic problems on linked lists: Comparison/ Cycle Detection/ Merge Point Detection/ Merging the lists, Coding solution for the circular linked data and Double linked data, coding problems, Examples, Practice problems

#4: Problem Solving using Abstract data structures: Stacks

Problem solving using Stacks, Coding solutions for the implementation of stack
using an array, Coding solutions for the implementation of stack using a linked list. Problem solving on expression conversion and evaluation, Examples, Practice problems

#5: Problem Solving through Queues & Search-Sort Algorithms

Problem solving using Queues, Coding solutions for the implementation of queue using an array/ linked list, Divide & Conquer Strategies: Linear Vs Binary Search Analysis, Bubble sort and Selection Sort Analysis, Examples, Practice problems

#6: Problem Solving through Divide & Conquer Strategies

Divide & Conquer Strategies: Quick sort Analysis, Merge Sort Analysis, Min/Power functions, Examples, Practice problems.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

DATA STRUCTURES LAB

SYLLABUS FOR B.E. III-SEMESTER

L:T:P(Hrs./week):0:0:3	SEE Marks : 50	Course Code : **U24PC311IT**
Credits : 1.5	CIE Marks : 30	Duration of SEE : 3 Hours

Course Objectives	Course Outcomes
The Objectives of the course:	*On completion of the course, students will be able to:*
1. Demonstrate stacks, queues, linked lists and its applications. 2. Provide hands-on experience to perform searching, sorting problems insertion and deletion operations on non-linear data structures.	1. Implement operations on stacks, queues and linked lists and evaluate expressions. 2. Execute insert, search and delete operations on trees. 3. Implement priority queues, heaps and sorting. 4. Implement graph traversal algorithms. 5. Implement multi way search trees.

1. Menu driven program that implements Stacks using arrays for the following operations
   a)create b)push c)pop d) peek
2. Implementation of Infix to Postfix Conversion and evaluation of postfix expression.
3. Menu driven program that implements Queues using arrays for the following operations
   a)create b)insert c)delete d) display
4. Menu driven program that implements Circular Queues for the following operations
   a)create b)Insert c)delete d) display
5. Implementation of Singly Linked List, Stack using Singly Linked List, Queue using Singly Linked List.
6. Implementation of polynomial operations using Linked List.
7. Implementation of Doubly Linked List, Circular linked list.
8. Implementation of Operations on Binary Tree (Insert, Delete, Level Order, Search)
9. Implementation of Recursive and Iterative Traversals on Binary Trees.
10. Implementation of Operations on Priority Queues and Heaps.
11. Implementation of Operations on Binary Search Tree.
12. Implementation of operations on AVL Tree.
13. Implementation of Breadth First search Traversal on Graphs.
14. Implementation of Depth First search Traversal on Graphs.

15. Implementation of prim's and Kruskals Algorithm for Minimum Spanning Tree
16. Implementation of Heap Sort.

Virtual Lab :

17. Stacks and Queues: https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html
18. Polynomial Arithmetic: https://ds1-iiith.vlabs.ac.in/exp/poly-arithmetic/index.html

Learning Resources

1. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, 2/e, Universities Press, 2008
2. Mark A Weiss, Data Structures and Algorithm Analysis In C, Second Edition (2002), Pearson
3. Richard F, Gilberg, B.A. Forouzan, "Data Structures, A Pseudocode Approach with C", Cengage, 2nd Edition
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stem 'Introduction to Algorithms' 3rd Edition.
5. Tanenbaum A. M , Langsam Y. Augenstein M. J, Data Structures using C, Second Edition (2008), Pearson
6. Data Structures through C in depth,S K Srivastava,Deepali Srivastava,BPB publications,2nd Edition

Online Resources:

1. http://nptel.ac.in/courses/106106127/
2. http://nptel.ac.in/courses/106103069/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/lecture-videos/

No. of Internal Tests:	02
Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work	18

Duration of Internal Test: **3 Hours**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

OBJECT ORIENTED PROGRAMMING LAB

SYLLABUS FOR B.E. III-SEMESTER

L:T:P(Hrs./week):0:0:3	SEE Marks : 50	Course Code : **U24PC321IT**
Credits : 1.5	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVE	COURSE OUTCOMES
The Objectives of the course:	*On completion of the course, students will be able to:*
1. Illustrate the key features of Object-Oriented Programming, threads and files. 2. Demonstrate command line as well as graphical user interface applications.	1. Implement object-oriented programming features using Java. 2. Implement exception handing and multithreading. 3. Execute I/O and string manipulation operations using java libraries. 4. Implement data structures using collection framework. 5. Develop GUI using java libraries, following MVC architecture.

JAVA API(java.lang package)

1. A program to illustrate the concept of arrays in Java.
2. A program to demonstrate the use of command line arguments.
3. A program to illustrate the concept of inheritance.
4. A program to illustrate the concept of dynamic polymorphism.
5. A program to illustrate the concept of abstract class.
6. A program to demonstrate various access specifiers and their scope using packages.
7. A program to demonstrate how multiple inheritance is achieved using interfaces.
8. A program to demonstrate the use of Lambda functions.
9. A program to demonstrate exception handling by using throw, finally & multiple catch statements.
10. A program to illustrate the concept of user-defined exception.
11. A program to create multiple threads using Thread class and Runnable interface.
12. A program to illustrate the concept of thread synchronization.
13. IITD virtual Lab core java programming simulations.

JAVA API(java.io package)

14.a) A program to illustrate the use of FileInputStream and FileOutputStream

b) A program to illustrate the use of BufferedInputStream and BufferedOutputStream.
c) A program to illustrate serialization and deserialization using ObjectInputStream and ObjectOutputStream.

JAVA API(java.util package)

15.a) A program to demonstrate the use of Scanner class to read user input.
b) A program to demonstrate the use of StringTokenizer.
c) A program to demonstrate the use of regular expressions.
16. A program to demonstrate the use of java.time.
17. An application to demonstrate the use of Collection framework classes and algorithms for implementing data structures.

JAVA API(Swing and JavaFX Packages)

18. a) An application involving GUI with different controls using Swing.
b) An application involving GUI with different controls using JavaFX.

Virtual Lab:

19. Understanding Life cycle of a Thread: https://java-iitd.vlabs.ac.in/exp/life-cycle-thread/

Learning Resources:

1. Herbert Schildt, The Complete Reference Java, 9th Edition, Tata McGraw Hill Education,2014.
2. Nell Dale, Chip Weems, Programming and Problem solving with JAVA, Jones, and Bartlett Publisher, 2004.
3. C Thomas Wu, An Introduction to Object Oriented Programming with Java, 5th edition, McGraw Hill Publishing, 2010.
4. Y. Daniel Liang , An Introduction to JAVA Programming, Tata McGraw Hill, 2009.
5. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2012.
6. https://nptel.ac.in/courses/106105191/
7. https://docs.oracle.com/javase/tutorial/
8. https://java-iitd.vlabs.ac.in/List%20of%20experiments.html

No. of Internal Tests:	02
Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work	18

Duration of Internal Test: **3 Hours**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

NETWORK ENGINEERING LAB

SYLLABUS FOR B.E. III-SEMESTER

L:T:P(Hrs./week):0:0:2	SEE Marks : 50	Course Code : **U24PC331IT**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVE	COURSE OUTCOMES
The Objectives of the course:	*On completion of the course, students will be able to:*
1. Introduce the fundamental concepts in Networking, OSI and TCP/IP protocol suite. 2. Demonstrate Switching, Routing and Wireless networking concepts using Packet Tracer tool.	1. Identify and Configure LAN switching technologies 2. Implement IP addressing and subnetting. 3. Design and configure routers, switches and wireless devices. 4. Build configuration for DHCP server and client. 5. Identify and provide security to LAN Ports.

List of Experiments:

1. **Basic Networking Commands-**The networking commands like ipconfig, netstat, ping, system info, lookup, traceroute, hostname, Arp are discussed.
2. **Configure Initial Switch Settings**- Connect a switch to a PC via a console cable, specify the switch's name using IOS commands, then set up passwords to safeguard the switch using Packet Tracer Simulator. Save the switch's configuration to its NVRAM (Using IOS commands).
3. **Connect a Wired and Wireless LAN**- Connect all devices in the supplied activity using guided media in accordance with the directions on the instructions page by using the packet tracer simulator and verify end-to-end connectivity
4. **Subnet an IPv4 Network-** Create an IPv4 Network Subnetting Scheme, configure the devices, test the network and troubleshoot it.
5. **Sub-netting Scenario-** Design an IP addressing scheme using FLSM (Fixed Length Subnet Mask) and assign IP addresses to network devices as per instructions given in instructions page in packet tracer activity and check connectivity.
6. **Design and Implement a VLSM addressing Scheme-** Given a network address and host requirements, create a VLSM (Variable Length Subnet Mask) addressing scheme by setting up addressing on network hosts, switches, and routers. Verify IP connectivity and troubleshoot connectivity issues as required.

7. **Configure IPv6 Addressing Scheme-** To Set Up Topology by configuring basic Router and Switch Settings and IPv6 Addresses manually and to verify end-to-end Connectivity
8. **Build a small network. -** Create a new IPv4 addressing scheme that will accommodate 4 subnets using the 192.168.0.0/24 network. 25 hosts are required by the IT department.(The Web server, ISP cluster, and Central router have been completely configured). 50 hosts are required for the sales division. 100 hosts are needed in the subnet for the remaining employees. To support 25 hosts, a Guest subnet will be implemented in the future. On R1, you must also complete the fundamental interface and security setups. On switches S1, S2, and S3, you will configure the Switch Virtual interface and the fundamental security settings.
9. **Configure SSH-** Replace Telnet protocol with SSH using CISCO IOS Commands on networking devices to encrypt communication between client and server and to verify connectivity.
10. **Implement VLANs and Trunking-** To configure and implement Virtual LANs by assigning ports and create static and dynamic trunks.
11. **Configure Router-on-a-Stick Inter-VLAN Routing: -** To add VLANs to a switch and configure sub interfaces on the router in order to test the connectivity with Inter VLAN Routing.
12. **Configure DHCPv4-** To configure a router as a DHCP server, PCs as DHCP clients and other routers as DHCP relay agents as per the instructions given in packet tracer activity, verify DHCP and test the connectivity.
13. **Implement Port Security-**In the given Topology Implement Port Security on Switches and verify.
14. **Configure a Wireless Network-** To connect wired and wireless devices to a wireless router, configure and add access point to extend wireless coverage.

Virtual Lab:

15. Cisco Packet Tracer to visualize and simulate a network: https://skillsforall.com/course/getting-started-cisco-packet-tracer?utm_source=netacad.com&utm_medium=referral&utm_campaign=packet-tracer&courseLang=en-US&userlogin=0

Learning Resources:

https://www.netacad.com/courses/networking/ccna-introduction-networks
https://www.netacad.com/courses/networking/ccna-switching-routing-wireless-essentials

No. of Internal Tests:	02
Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work	18

Duration of Internal Test: **2 Hours**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
ACCREDITED BY NAAC WITH 'A++' GRADE
IBRAHIMBAGH, HYDERABAD – 500 031

OPEN ELECTIVES – I		
Department	**Code**	**Title**
Civil	U24OE310CE	Green Buildings
CSE	U24OE310CS	Introduction to Python Programming
CSE	U24OE320CS	Programming Essentials in Python (Stream: Artificial Intelligence & Machine Learning)
MECH	U24OE320ME	Fundamentals of Unmanned Aerial Vehicles
MECH	U24OE310ME	Introduction to Industrial Robotics (Stream: Robotics)
IT	U24OE310IT	Fundamentals of Python Programming
IT	U24OE320IT	Computing using Python (Stream: AI&ML)
EEE	U24OE310EE	Non-Conventional Energy Sources
Chemistry	U24OE310CH	Corrosion Science and Technology
Physics	U24OE310PH	Fundamentals of Smart Materials and Applications
H&SS	U24OE320EH	Learning to Learn
H&SS	U24OE360EH	Constitution of India
H&SS	U24OE370EH	Introduction Journalism
H&SS	U24OE350EH	Introduction to Financial Services (Stream: Banking, Finance, Securities and Investments)
Mathematics	U24OE320MA	Number Theory & Boolean Algebra

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

GREEN BUILDINGS (OPEN ELECTIVE-I)

SYLLABUS FOR B.E. III-SEMESTER

L : T : P (Hrs./week):2:0:0	SEE Marks:60	Course Code: U24OE310CE
Credits: 2	CIE Marks:40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	Upon the completion of this course the students will be expected to:
1. Learn the principles of planning and orientation of buildings. 2. Environmental implications of natural and building materials along with green cover 3. Acquire knowledge on various aspects of green buildings	1. Explain the principles of building planning, its bylaws and provide facilities for rainwater harvesting. 2. Analyse the aspects of energy, water and waste management in buildings. 3. Understand the concepts of green building technologies. 4. Understand rating systems of GRIHA IGBC and LEED.

UNIT-I: Planning of buildings: Principles of planning, Relevant building bylaws, site selection for buildings, orientation of buildings, Provision of rain water harvesting

UNIT-II: Building-Energy-Implications: Environmental implications of buildings energy, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental Implications. Green building materials and recycling, Green cover and built environment

UNIT-III: Green Building Technologies: Introduction- Necessity - Concept of Green building. Principles of green building – Site selection criteria for Green Buildings – effective cooling and heating systems – effective electrical systems-Passive solar architecture - effective water conservation systems

UNIT-IV: Certification Systems: Certification systems- Green Rating for

Integrated Habitat Assessment (GRIHA), Indian Green Building Council (IGBC) and Leadership in Energy and Environmental Design (LEED), case studies

Learning Resources:

1. Kumara Swamy N.Kameswara Rao A., Building Planning and Drawing, Charotar, Publications, 2013.
2. Shahane, V. S, "Planning and Designing Building", Poona, Allies Book Stall, 2004.
3. Michael Bauer, Peter Mösle and Michael Schwarz "Green Building – Guidebook for Sustainable Architecture" Springer, 2010.
4. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison "Green Building Handbook" Volume I, Spon Press, 2001.
5. Mili Majumdar, "Energy-efficient buildings in India" Tata Energy Research Institute, 2002.
6. TERI "Sustainable Building Design Manual- Volume I & II" Tata Energy Research Institute, 2009.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	2	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	2	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
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IBRAHIMBAGH, HYDERABAD – 500 031
Department of Computer Science & Engineering

INTRODUCTION TO PYTHON PROGRAMMING

(OPEN ELECTIVE-I)

SYLLABUS FOR B.E. III-SEMESTER (Common for CIVIL, ECE, EEE & MECH)

L:T:P (Hrs./week): 2:0:0	SEE Marks :60	Course Code:**U24OE310CS**
Credits : 2	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1 Acquire problem solving skills	1 Design python programs using arithmetic expressions and decision making statements
2 Learn programming and solve problems using Python language	2 Design modular python programs using functions 3 Develop programs using strings and list 4 Develop programs using tuples and dictionaries

CO-PO and CO-PSO mapping

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1		1	1									1		2
CO2	1	1	1	1	2								1		2
CO3	1	1	1	1	2								2		2
CO4	1	1	1	1	2								2		2
CO5	1		1	1									1		2

UNIT-I: **Introduction to Python**: Variables, expressions and statements, order of operations

Conditionals: Modulus operators, Boolean expressions, logical operators, conditional execution, alternative executions, chained conditional, nested conditional

Iteration: while statement

UNIT-II: Functions: Function calls, type conversion and coercion, mathematical functions, User-defined functions, parameters and arguments.
Recursion

UNIT-III: Strings: string length, string traversal, string slices and string comparison with examples, strings are immutable, find function, string module

List: list values, accessing elements, list traversal, list length, list membership, list and for loop, list operations with examples

UNIT-IV: **Tuples**: Mutability, tuple assignment, tuple as return values

Dictionaries: dictionary operations, dictionary methods, aliasing and copying, counting letters using dictionaries

Learning Resources:

1. Downey A, How to think like a Computer Scientist :Learning with Python, 1st Edition(2015), John Wiley
2. Lambert K.A, Fundamentals of Python –First Programs, 1st Edition(2015), Cengage Learning India
3. Perkovic L, Introduction to Computing using Python,2/e, (2015), John Wiley
4. Stewart Venit and Elizabeth Drake, Prelude to Programming: Concepts and Design, 6th Edition(2015),Pearson India
5. Mark J Guzdial, Introduction to Computing and programming in Python, 3rdEdition(2013), Pearson India
6. Allen Downey, Think Python, 2nd Edition(2015),Shroff Publisher Orielly
7. http://nptel.ac.in/courses/117106113/34
8. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-01sc-introduction-to-electrical-engineering-and-computer-science-i-spring-2011/python-tutorial/
9. www.scipy-lectures.org/intro/language/python_language.html

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2	No. of Assignments	:	2	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	2	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING(Autonomous)
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Department of Computer Science & Engineering

PROGRAMMING ESSENTIALS IN PYTHON

Stream - Artificial Intelligence & Machine Learning
(OPEN ELECTIVE-I)
(Common for CIVIL, ECE, EEE & MECH)
SYLLABUS FOR B.E. III-SEMESTER

L:T:P (Hrs./week): 2:0:0	SEE Marks : 60	Course Code :**U24OE320CS**
Credits : 2	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 Acquire problem solving skills	1 Design python programs using arithmetic expressions and decision making statements
2 Learn programming and solve problems using Python language	2 Design modular python programs using functions 3 Develop programs using strings and list 4 Develop programs using tuples and dictionaries

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1		1	1									1		2
CO2	1	1	1	1	2								1		2
CO3	1	1	1	1	2								2		2
CO4	1	1	1	1	2								2		2

UNIT-I: **Introduction to Python**: Variables, expressions and statements, order of operations
Conditionals: Modulus operators, Boolean expressions, logical operators, conditional execution, chained conditional, nested conditional
Iteration: while statement

UNIT-II: Functions: Function calls, Type conversion and coercion, mathematical functions, User-defined functions, parameters and arguments.
Recursion

UNIT-III: Strings: string length, string traversal, string slices and string

comparison with examples, strings are immutable, find function, string module

List: list values, accessing elements, list traversal, list length, list membership, list and for loop, list operations with examples

UNIT-IV: **Tuples**: Mutability, tuple assignment, tuple as return values

Dictionaries: dictionary operations, dictionary methods, aliasing and copying, counting letters using dictionaries

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7. http://nptel.ac.in/courses/117106113/34
8. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-01sc-introduction-to-electrical-engineering-and-computer-science-i-spring-2011/python-tutorial/
9. www.scipy-lectures.org/intro/language/python_language.html

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	2	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	2	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
FUNDAMENTALS OF UNMANNED AERIAL VEHICLES
(**General Pool**)
(Open Elective-I)
SYLLABUS FOR B.E.III-SEMESTER

L:T:P(Hrs/week):2:0:0	SEE Marks:60	Course Code: U24OE320ME
Credits :02	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE	**COURSE OUTCOMES**
	On completion of the course, students will be able to
The objective of this Course is to understand the features, basics of flight, manufacturing and analysis of UAV and Artificial Intelligence in UAV systems.	1 classify various types of UAVs, describe their characteristics, and analyze their applications. 2 illustrate, explain and interpret the fundamental concepts of aerodynamics relevant to flight vehicles. 3 fabricate, and analyse UAV components using appropriate tools and techniques. 4 identify, explain, and evaluate the role of Artificial Intelligence in UAV systems for autonomous operations.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2				3	3	3				3	3	2	3
CO2	3	3				3	3	2				3	3	2	3
CO3	3	2				3	3	2				3	3	2	3
CO4	3	2				3	3	2				3	3	2	3

Unit-I:
Introduction to UAV
UAV: Definition, History; Difference between aircraft and UAV; DGCA Classification of UAVs; Types and Characteristics of Drones: Fixed, Multi-rotor, and Flapping Wing; Applications: Defense, Civil, Environmental monitoring.

Unit-II:
Basics of Flight
Different types of flight vehicles; Components and functions of an airplane; Forces acting on Airplane; Physical properties and structure of the atmosphere; Aerodynamics – aerofoil nomenclature, aerofoil characteristics, Angle of attack, Mach number, Lift and Drag, Propulsion and airplane

structures.

Unit-III:
Manufacturing and Analysis of UAV
Drone Manufacturing, Additive Manufacturing, Health Evaluation and Failsafe, Introduction to CAD; Design of UAV components; Structural Analysis using CAE; Aerodynamic Analysis using CFD; Manufacturing of the components of UAVs: 3D printing; Case studies;

Unit-IV:
Artificial Intelligence in UAV Systems
Components: Arms, motors, propellers, electronic speed controller (ESC), flight controller; Propulsion; Data Link; Sensors and Payloads: GPS, IMU, Light Detection and Ranging (LiDAR), Imaging cameras, Classification of payload based on applications; Hyper-spectral sensors; Laser Detection and Range (LADAR); Synthetic Aperture Radar (SAR); Thermal cameras; ultra-sonic detectors; Case study on payloads. Introduction to navigation systems and types of guidance; Mission Planning and Control.

Learning Resources:
1. Andey Lennon, "Basics of R/C Model Aircraft Design" Model Airplane News Publication
2. John Baichtal, Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs.
3. K Valavanis, George J Vachtsevanos, Handbook of Unmanned Aerial Vehicles, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.
4. DGCA RPAS Guidance Manual, Revision 3 – 2020

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Test:	30
2	No. of Assignments:	02	Max. Marks for each Assignment:	05
3	No. of Quizzes:	02	Max. Marks for each Quiz Test:	05

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
INTRODUCTION TO INDUSTRIAL ROBOTICS
(Stream: Robotics)
(Open Elective-I)
SYLLABUS FOR B.E.III-SEMESTER

L:T:P(Hrs/week):2:0:0	SEE Marks:60	Course Code: U24OE310ME
Credits :02	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE The objective of the course is to	COURSE OUTCOMES On completion of the course, students will be able to
study industrial robot components, configuration, sensors, drives, applications and programming through experiential learning.	1 explain configuration of industrial robots and summarize various applications. 2 interpret various elements of the industrial robots 3 Develop methodology to represent position and orientation of industrial robot links in spatial coordinate system. 4 classify various sensors used in industrial robots and interface between the human user and an industrial robot using various programming languages.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2			1	2	2					2	3	1	2
CO2	3	2			1	2	2					2	3	1	2
CO3	3	2			1	2	2					2	3	1	2
CO4	3	2			1	2	2					2	3	1	2

UNIT-I
ROBOT BASICS
Robot-Basic concepts, Need, Law, History, Anatomy, specifications.
Robot configurations-cartesian, cylindrical, polar, articulated and SCARA. Parallel robots
ROBOT APPLICATIONS
Application in industry – material handling, loading & unloading, processing, welding & painting, assembly and inspection

UNIT-II
ROBOT ELEMENTS
End effectors-Classification, Types of Mechanical actuation, Gripper design, Robot

joints types, Robot drive system types: Electrical, pneumatic and hydraulic.

UNIT-III
ROBOT COORDINATE SYSTEMS
Coordinate frames, Rotation matrix, Euler angles, Roll pitch and yaw angle representation, Composite rotations, Homogeneous Transformation matrix.

UNIT-IV
ROBOT SENSORS
Sensors in robots – Touch sensors-Tactile sensors – Proximity and range sensors. Force sensors

Robot programming
On line programming, teach pendant control, Lead through, Walk through, off line programming, Task programming.

Learning Resources:
1. Mikell P. Groover, Mitchell Weiss, Roger N Nagel and Nicholas G Odrey, "Industrial Robotics Technology, Programming and Applications", Tata Mc Graw-Hill Publishing Company Limited, 2008.
2. Deb.S.R and Sankha Deb, "Robotics Technology and Flexible Automation", Tata Mc Graw Hill Publishing Company Limited, 2010.
3. Klafter R.D, Chmielewski T.A, and Negin. M, "Robotic Engineering: An Integrated Approach", Prentice Hall of India Pvt. Ltd., 1994.
4. K.S. Fu, R.C. Gonzalez and C.S.G. Lee, "Robotics control, sensing, vision and intelligence", Tata Mc Graw-Hill Publishing Company Limited, 2008
5. R.K. Mittal and I. J. Nagrath "Robotics and Control", Tata Mc Graw-Hill Publishing Company Limited, 2003.

The break-up of CIE: Internal Tests+Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Test:	30
2	No. of Assignments:	02	Max. Marks for each Assignment:	05
3	No. of Quizzes:	02	Max. Marks for each Quiz Test:	05

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERBAD-500031,
DEPARTMENT OF INFORMATION TECHNOLOGY

FUNDAMENTLAS OF PYTHON PROGRAMMING

(GENERAL POOL STREAM: OPEN ELECTIVE-I)
(Common for CIVIL, ECE, EEE & MECH) SYLLABUS FOR B.E. III SEMESTER

L:T:P(Hrs./week):2:0:0	SEE Marks :60	Course Code:**U24OE310IT**
Credits : 2	CIE Marks :40	Duration of SEE : 3 Hours

Course Objectives	Course Outcomes
The Objectives of the course:	*On completion of the course, students will be able to*
Acquire problem solving skills for writing python scripts	1. Understand the fundamentals of python and implement control structures. 2. Understand basic knowledge on strings,lists and tuples. 3. Implement programs using dictionaries, and sets. 4. Implement OOP concepts in python.

UNIT – I:
Basics of Python Programming: Features of Python, variables and identifiers, operators and expressions.
Decision control statements: Selection/Conditional branching statements,basic loop structures/iterative statements, nested loops, break, continue and pass statements.
Functions: Definition, function call, more on defining functions, recursive functions.

Unit – II:
Strings: Introduction, accessing strings, basic operations, string slice, String function and methods, Regular Expressions,introduction to lists.
Tuples: Introduction, operations on tuples, packing and unpacking, nested tuples, tuple methods and functions.

UNIT – III:
Set: Introduction, Set operations.
Dictionaries: Basic operations, sorting items, looping over dictionary, nested dictionaries, built-in dictionary functions.

UNIT – IV:

OOPS Concepts: Introduction, classes and object, class method and self-argument, the __init__()method, class variables and object variables, public and private data members, Inheritance, Operator Overloading.

Files: Reading and writing files.

Learning Resources:

1 Allen Downey, "Think Python: How to Think Like a Computer Scientist", O'Reilly publications,2nd Edition.

2.Reema Thareja, "Python programming using problem solving approach ", Oxford university press.

3. Mark J Guzdial, Introduction to Computing and programming in Python, 3rd Edition (2013), Pearson India

4. https://onlinecourses-archive.nptel.ac.in/noc19_cs09/

5. http://nptel.ac.in/courses/117106113/34

6. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-01sc-introduction-to-electricalengineering-and-computer-science-i-spring-2011/python-tutorial/

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	02	Max. Marks for each Assignment:	05
3	No. of Quizzes:	02	Max. Marks for each Quiz Test:	05

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERBAD-500031,
DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTING USING PYTHON

(AI&ML TRACK: OPEN ELECTIVE-I)
(Common for CIVIL, ECE, EEE & MECH) SYLLABUS FOR B.E. III SEMESTER

L:T:P(Hrs./week):2:0:0	SEE Marks :60	Course Code:**U24OE320IT**
Credits : 2	CIE Marks :40	Duration of SEE : 3 Hours

Course Objectives	Course Outcomes
The Objectives of the course:	*On completion of the course, students will be able to*
Acquire problem solving skills for writing python scripts	1. Understand the fundamentals of python and implement control structures. 2. Understand string, lists and tuples and perform the key operations on these data containers. 3. Implement dictionaries and set operations in python. 4. Implement OOP concepts in python.

UNIT – I:
Introduction to Python: Features of Python, variables and identifiers, operators and expressions.
Decision making and repetition: if, if else, nested if-else and else if, while loops and for loops, nested loops, break, continue, pass
Functions: Definition, function call, more on defining functions, recursive functions.

Unit – II:
Strings: Introduction, accessing strings, basic operations, string slice, String function and methods, Regular Expressions.
Lists: Introduction, Operations on lists, nested list, list methods, list comprehension.
Tuples: Introduction, operations on tuples, packing and unpacking, nested tuples, tuple methods and functions.

UNIT – III:
Set: Introduction, Set operations.
Dictionaries: Basic operations, sorting items, looping over dictionary, nested dictionaries, built-in dictionary functions.

UNIT – IV:
OOPS Concepts: Introduction, classes and object, class method and self-

argument, the __init__()method, class variables and object variables, public and private data members, Inheritance, Operator Overloading.
Files: Reading and writing files, serialization using JSON and pickle

Learning Resources:

1 Allen Downey, "Think Python: How to Think Like a Computer Scientist", O'Reilly publications,2nd Edition.
2.Reema Thareja, "Python programming using problem solving approach ", Oxford university press.
3. Mark J Guzdial, Introduction to Computing and programming in Python, 3rd Edition (2013), Pearson India
4. https://onlinecourses-archive.nptel.ac.in/noc19_cs09/
5. http://nptel.ac.in/courses/117106113/34
6. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-01sc-introduction-to-electricalengineering-and-computer-science-i-spring-2011/python-tutorial/

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	02	Max. Marks for each Assignment:	05
3	No. of Quizzes:	02	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Non Conventional Energy Sources (Open Elective-I)
SYLLABUS FOR B.E. III SEMESTER

L: T: P (Hrs/Week):2:0:0	SEE Marks: 60	Course Code:**U24OE310EE**
Credits:2	CIE Marks: 40	Duration of SEE: 3Hours

COURSE OBJECTIVES The course will enable the students to:	**COURSE OUTCOMES** On completion of the course, students will be able to
To provide a survey of the most important renewable energy resources and the technologies for harnessing these resources within the framework of a broad range of simple to state- of -the-art energy systems.	1. Demonstrate the generation of electricity from various Non-Conventional sources of energy and solar power generation 2. Illustrate the generation of energy from wind and generation of energy from waste 3. Demonstrate the generation of energy by biomass and fuel cells

UNIT-I: Introduction and Solar Energy:
Introduction: Need for Non-conventional energy sources, Types of Non-Conventional energy sources. Renewable energy across the Global and in India. Renewable energy for rural applications, Renewable energy for urban, industrial and commercial applications

Solar Energy: Solar cell fundamentals: Semiconductors, Photovoltaic effect, Solar PV cell, module, panel, array, Solar cell operating characteristics: Voltage-current characteristic, energy losses, maximising the performance. Applications of solar energy, Solar energy program in India, Case study

UNIT-II: Wind Energy and Waste to Energy:
Wind Energy: Nature of wind, Basic components of Wind Energy Conversion System(WECS), Power extraction from the wind, Applications of wind energy. Wind energy program in India, Case Study

Waste to Energy: Key issues, Waste recovery management, Case study
UNIT-III: Biomass Energy and Fuel Cells:

BiomassEnergy: Definition, Bio fuels, Biomass resources, Biomass conversion technologies: Incineration- Thermo chemical conversion- Bio-chemical conversion. Advantages and disadvantages of biomass energy, Case study

Fuel Cells: Definition-Classification of fuel cells, Principle of operation, Hydrogen-oxygen fuel cell, Alkaline fuel cell, Proton exchange membrane fuel cell, Molten carbonate fuel cell, Solid oxide electrolyte cells, Comparison of fuel cells- Advantages and Disadvantages of fuel cells-Applications of Fuel cells. Case study

UNIT-IV: Ocean Energy and Geothermal Energy:

Ocean Energy: Ocean thermal electric conversion (OTEC) methods: Open cycle and Closed cycle- Principles of tidal power generation-Advantages and limitations of tidal power generation, Case study

Geothermal Energy: Geothermal resources- Vapour dominated geothermal plant- Liquid dominated geothermal plant- Applications of Geothermal Energy, Case study

Learning Resources:

1. B H KHAN, Non-Conventional Energy Resources, McGraw Hill, 2nd Edition, 2009.
2. G. S. Sawhney, Non-Conventional Energy Resources, PHI Learning Pvt Ltd, 2012
3. ShobhNath Singh, Non-Conventional Energy Resources, Pearson, 2016
4. G.D. Rai, Non-Conventional Energy Sources ,Khanna Publishers, New Delhi, 2011.
5. Ashok Desai V, Non-Conventional Energy, Wiley Eastern Ltd, 1990.
6. Mittal K.M, Non-Conventional Energy Systems, Wheeler Publishing Co. Ltd, 1997.
7. Ramesh R, Kurnar K.U, Renewable Energy Technologies, Narosa Publishing House, New Delhi, 1997.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 2	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 2	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests :90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

ACCREDITED BY NAAC WITH A++ GRADE

DEPARTMENT OF CHEMISTRY

CORROSION SCIENCE AND TECHNOLOGY
B E III SEMESTER

Instruction : 2 H/ Week	Semester End Exam Marks : 60	Subject Reference Code : OE310CH
Credits : 2	Continuous Internal Exam Marks : 40	Duration of semester End Exam : 3 Hours

OBJECTIVES	OUTCOMES
The course will enable the students :	**At the end of the course students should be able to:**
1. To acquaint with the causes of corrosion and different types of corrosion. 2. To understand the factors influencing corrosion and Controlling Corrosion by Inhibitors and Organic Coatings. 3. To know different corrosion control coatings like electroplating and electrolessplating. 4. To familiarize with various preventive methods of corrosion such as cathodic protection and surface conversion.	1. Explain different types of corrosion with suitable examples. 2. Discuss different factors that affect corrosion and protection by organic coatings and inhibitors. 3. Select a suitable metallic coating for corrosion control 4. Discuss the principles and application of cathodic protection and surface conversion coatings for corrosion control.

CO-PO MAPPING												
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	2	1	-	-	-	-	1	-	-	-	-	1
2	2	1	-	-	-	-	1	-	-	-	-	1
3	2	1	-	-	-	-	1	-	-	-	-	1
4	2	1	-	-	-	-	1	-	-	-	-	2

UNIT-I: CHEMICAL AND ELECTROCHEMICAL CORROSION

Introduction - gravity, cause**,** Chemical and Electrochemical corrosion - Mechanism, Pilling – Bed worth rule, effect of nature of oxide layer on rate of chemical corrosion, electrochemical series and galvanic series. Formation of anodic and cathodic areas, Galvanic corrosion, Differential aeration corrosion -pitting, water line corrosion & crevice corrosion, stress corrosion, corrosion fatigue.

UNIT-II: CORROSION CONTROL METHODS INHIBITORS AND ORGANIC COATINGS

A. Factors influencing corrosion

Nature of metal: Relative position of metal in galvanic series, over voltage, relative areas of anode & cathode and nature of corrosion product.
Nature of environment: temperature, pH and humidity.

B. Corrosion Control by Inhibitors and Organic Coatings

Corrosion Inhibitors: Anodic, Cathodic and vapor phase inhibitors.
Organic Coatings: Paints – constituents and their functions, vitreous enamel coatings, varnishes and lacquers.

UNIT-III: METALLIC COATINGS

Passivation of metals, polarization curve of passivating metals, effect of pH and potential-pH diagram for iron (Pourbaix Diagram) and polarization curve of iron, application of Pourbaix diagram for corrosion mitigation.
Metallic coatings: Types - anodic & cathodic. Surface pre-treatment of base metal.
Methods of application of metallic coatings: Hot dipping- galvanization - applications of galvanized RCC steel bars. Cladding, electro plating & electroless plating- principle and their differences.
Electroplating of Cu coating on Fe, Electroless plating of Ni coating on Insulators, Preparation of PCB using Electroless plating.

UNIT-IV: CATHODIC PROTECTION AND SURFACE CONVERSION

Cathodic protection: Principle, sacrificial anodic protection (SAP), impressed current cathodic protection (ICCP). Application of cathodic protection for bridges, ship hulls and underground pipelines.
Surface conversion coatings: Carburizing, Nitriding, Cyaniding.

Books:

1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002)
2. S.S. Dara "A text book of engineering chemistry" S.Chand&Co.Ltd., New Delhi (2006).
3. O.G. PALANNA, Engineering Chemistry, TMH Edition.
3. Chemistry of Engineering Meterials by R.P Mani and K.N.Mishra, CENGAGE learning
4. Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, NewDelhi (2008).

Suggested Reading:

1. Principles and prevention of corrosion: Denny A Jones, Prentice Hall, 1996.
2. Derek Pletcher and Frank C. Walsh, "Industrial Electrochemistry", Chapman and Hall, New York, 1993
3. Fundamentals of Corrosion: Michael Henthorne, Chemical Engineering
4. Corrosion Engineering: Mars G Fontana, Mc Graw Hill, 1987

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF PHYSICS

FUNDAMENTALS OF SMART MATERIALS AND APPLICATIONS
OPEN ELECTIVE COURSE

L : T : P	Credits	**CIE** Marks	**SEE** Marks	**SEE Duration**	**Course Code**
02: 0: 0	02	40	60	3 hours	**U24OE310PH**

Course Objectives	**Course Outcomes**
The student will be able to	**the student should at least be able:**
1. To introduce various types of smart materials used in engineering. 2. Grasp the concepts of piezo and ferroelectric materials. 3. Learn fundamentals of pyro and thermoelectric materials 4. Gain knowledge on shape memory alloys	1. Identify various smart materials and their significant applications. 2. Summarize various properties and applications of peizo and ferroelectric materials. 3. Apply fundamental principles of pyro and thermoelectricity in relevant fields of engineering. 4. Explain types of shape memory alloys and their properties and applications

CO-PO Mapping

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

UNIT I: INTRODUCTION TO SMART MATERIALS (6 hours)

Characteristics of metals, polymers and ceramics. Introduction to smart materials, need for smart materials, Classification of smart materials, Components of a smart System, Applications of smart material, role of smart materials in developing intelligent systems and adaptive structures.

UNIT II: PIEZO AND FERRO ELECTRIC MATERIALS (8 hours)

Piezo electric effect and inverse piezoelectric effect, Piezo electric materials, Structure of Quartz crystal, piezoelectric oscillator, Magnetostriction, Magnetostriction oscillator, piezo-electric sensors, applications of Piezo-electric materials. Characteristics and properties of ferroelectric materials, Curie-Weiss law, applications of Ferro electric materials.

UNIT III: PYRO AND THERMO-ELECTRIC MATERIALS (6 hours)

Pyro electricity: pyro electric effect, pyro electric materials, pyro-electric detector.

Thermoelectricity: thermoelectric effect, Seebeck effect, Peltier effect, thermocouple, Principle and working of thermoelectric generator and

Thermoelectric cooler, applications of thermoelectric materials

UNIT IV: SHAPE MEMORY MATERIALS (8 hours)

Introduction to shape memory alloys (SMA)- Shape Memory Effect (SME), Austenite, Martensite phases, Properties and characteristics SMAs**,** one-way and two-way shape memory effects, Properties of Ni-Ti shape memory alloy, Cu-based shape memory alloys, and their applications, Applications of SMAs.

Learning Resources:

1. Mukesh V. Gandhi, Brian S Smart Materials and Structures, Thompson, Springer, May- 1992
2. D. Patranabis, Sensors and Transducers, PHI Learning Pvt. Ltd., 2022
3. Nachiketa Tiwari, B. Bhattacharya, Smart Material, Adaptive Structures & Intelligent Mechanical systems

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES
COURSE NAME-LEARNING TO LEARN
(Open Elective) SYLLABUS FOR B.E. III SEMESTER

Instruction: 2 Hours	SEE: 60	Course code: U24OE320EH
Credits: 1	CIE: 40	Duration of SEE: 2 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the learners to: 1. Introduce Computational Thinking concepts and relate them to basic coding principles. 2. Teach abstraction to focus on essential coding elements while ignoring unnecessary details. 3. Develop skills to design algorithms and write efficient code. 4. Solve real-world problems by combining coding skills with Computational Thinking principles.	At the end of the course the learners will be able to: - 1. Students will decompose coding problems into manageable sub-problems and represent them visually using flowcharts or pseudocode. 2. Students will implement abstraction by designing reusable functions and using appropriate data structures. 3. Students will write, debug, and optimize simple programs using structured algorithms. 4. Students will create mini coding projects demonstrating their ability to apply CT principles to real-world challenges.

Course Objectives:

- Strengthen students' problem-solving and coding abilities using Computational Thinking.
- Develop structured approaches to designing algorithms and writing efficient code.

UNIT 1: Foundations of Computational Thinking and Coding

1.1 Decomposition: Breaking Coding Problems into Smaller Steps
1.2 Pattern Recognition: Identifying Recurring Solutions in Code
1.3 Tools for CT: Flowcharts, Pseudocode, and Visual Problem Solving

UNIT 2: Problem-Solving with Abstraction

2.1 Basic Programming Constructs: Loops, Conditionals, and Variables
2.2 Simplifying Complex Problems: Identifying Core Logic
2.3 Abstraction in Function Design (Defining Input and Output)

UNIT 3: Algorithmic Thinking for Coding Efficiency

3.1 Writing Algorithms: Step-by-Step Logical Instructions
3.2 Data Structures as Abstractions: Arrays, Lists, and Dictionaries
3.3 Debugging and Optimization: Finding and Fixing Errors in Code

UNIT 4: Applying Computational Thinking to Real-World Problems
4.1 Problem Solving with Code: Building Mini Projects (e.g., a Calculator, Sorting Algorithms)
4.2 Case Studies: How Computational Thinking Solves Real-World Problems
4.3 Collaborative Problem Solving: Working in Teams to Tackle Coding Challenges

Methodology

1. **Hands-On Coding Labs:**
- Write simple Python programs to implement CT concepts.
- Examples: Fibonacci sequence generator, basic search algorithms.
2. **Case Studies and Examples:**
- Explore how CT principles (e.g., divide-and-conquer) solve problems like sorting or pathfinding.
- Case studies: Binary Search, Google Maps routing.
3. **Group Projects:**
- Teams design, code, and debug small projects, applying decomposition, abstraction, and algorithmic thinking.
4. **Assessments:**
- Online coding challenges (using HackerRank or similar platforms).
- Mid-term project: Write and optimize a simple algorithm (e.g., finding the largest number in an array).

Learning Resources

- **Books:**
  - "Think Like a Programmer" by V. Anton Spraul.
  - "Python Crash Course" by Eric Matthes.
- **Online Platforms:**
  - Codecademy, LeetCode, or Edabit for practice problems.

LEARNING RESOURCES

learn.talentsprint.com

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal tests	:	2	Max. Marks	:	30
2	No. of assignments	:	2	Max. Marks	:	5
3	No. of Quizzes	:	2	Max. Marks	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

CONSTITUTION OF INDIA
BASIC FEATURES & FUNDAMENTAL PRINCIPLES
(Common to all branches) SYLLABUS FOR B.E. 2/4- III semester

Instruction: 2 per week	SEE:60	Course code: U24OE360EH
Credits:2	CIE:40	Duration of SEE:3 hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the learners to: 1. To acquaint the students with legacies of constitutional development in India and help them to understand the most diversified legal document of India and philosophy behind it. 2. To make students aware of the theoretical and functional aspects of the Indian Parliamentary System. 3. To channelize students' thinking towards basic understanding of the constitutional principles and statutory institutions.	At the end of the course the learners will be able to: - 1. Identify and explore the basic features and modalities about Indian constitution. 2. Understand the administrative structure of various branches of government. 3. Differentiate and relate the functioning of Indian parliamentary system at the center and state level. 4. Examine different aspects of Indian Legal System and its related bodies.

CONSTITUTION OF INDIA – BASIC FEATURES & FUNDAMENTAL PRINCIPLES

Unit –I: Constitution: Meaning & Constitutionalism, Historical perspective: 1909 Act, 1919 Act & 1935 Act, Salient features & nature of the Constitution,

Unit –II: Fundamental Rights: Introduction & its scheme, Right to Equality (Art.14), Right to Fundamental Freedoms (Art. 19), Right to Life (Art. 21), Directive Principles of State Policy: importance and implementation, Fundamental Duties and its legal status.

Unit –III: Government: Union & State – Executive & Legislature, composition, powers and functions, Local Self Governments – Panchayat Raj Institutions & Urban Local Bodies (Municipalities). Statutory Institutions: Elections-Election Commission of India, National Human Rights Commission, National Commission for Women.

]Unit –IV : Federal structure & distribution of legislative and financial powers between the Union and the States.

Suggested Readings:

1. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, New Delhi.
2. Indian Constitution by Subhash C. Kashyap, National Book Trust,New Delhi.
3. Constitution of India and Professional Ethics, Dr. G. B. Reddy &Mohd. Suhaib, Dreamtech Press.
4. B.Z. Fadia & Kuldeep Fadia, Indian Government &Politics, Lexis Nexis, New Delhi.
5. Indian Polity by Laxmikanth 5th Edition, McGraw Hill.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal tests	:	2	Max. Marks	:	40
2	No. of assignments	:	3	Max. Marks	:	5
3	No. of Quizzes	:	3	Max. Marks	:	5

Duration of Internal Tests :90 Minutes

VASAVI COLLEGE OF ENGINEERING (A)
DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

COURSE NAME: **INTRODUCTION TO JOURNALISM**
(Common to all branches) B.E. III SEMESTER

Instruction: 2 Hours	SEE: 60	Course code: U24OE370EH
Credits: 2	CIE: 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
What the course aims to achieve: 1. To introduce students to the fundamentals of journalism and mass communication. 2. To develop skills in news writing, reporting, editing, and media production. 3. To explore the role and responsibilities of media in society and democracy. 4. To familiarize students with different types of media—print, broadcast, digital, and social. 5. To instill ethical standards and legal awareness in media practices.	What students should be able to demonstrate after the course: 1. Explain key concepts, history, and theories of journalism and mass communication. 2. Create accurate, clear, and engaging content for various media platforms. 3. Critically analyze the role of media in shaping public opinion and policy. 4. Use appropriate tools and technologies in media production and dissemination. 5. Apply journalistic ethics and understand media laws in professional practice.

UNIT-1: MASS COMMUNICATION: NATURE AND CONCEPT OF MASS COMMUNICATION
Defining Mass Communication - Nature - Functions and Scope of Mass Communication - Mass Communication as Distinct from Other Forms of Communication - Mass Communication and Mass Media: Advantages and Limitations - Process of Mass Communication - Interactive Communication- Mass Communication in a Democratic (and Developing) Nation

UNIT - 2: MASS MEDIA AND SOCIETY

Medium: Concept, Role and Functions – Scope of Media in the Indian Context – Classification of Media – Medium is the Message – Mass Media – Society and Development – Media Scene in India – Media Reach

UNIT –3: INTRODUCTION TO JOURNALISM AND PRINCIPLES OF JOURNALISM

Journalism: Definition and Functions – Role, Nature and Scope of

Journalism in the Indian Context (Democracy, Secularism and Development) - Press as Fourth Estate.
Journalism as Information & Communication – Objectivity - Comment is free, Facts are Sacred - Its Discontents, Truthfulness, Humanness, Social Responsibility, Social Good – Qualities of a Journalist – Duties and Responsibilities of Journalist – Code of Ethics

UNIT – 4: TYPES OF JOURNALISM (MEDIA AND SUBJECT SPECIFIC)

Media Specific: Print Journalism, Broadcast Journalism, Cyber Journalism, Investigative Journalism, Photo Journalism, Global Media Journalism, Yellow Journalism - Subject Specific: Development Journalism, Environmental Journalism, Civic Journalism, Lifestyle Journalism, Business Journalism, Sports Journalism and Health Journalism

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal tests	:	2	Max.Marks	:	30
2	No. of assignments	:	3	Max. Marks	:	5
3	No. of Quizzes	:	3	Max. Marks	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGNEERING (AUTONOMOUS)
DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

INTRODUCTION TO FINANCIAL SERVICES

SYLLABUS FOR B.E-III SEMESTER
(Stream based Open Elective)

Instruction: 2 Hrs/week	SEE Marks: 60	Course Code: U24OE350EH
Credits: 2	CIE Marks:40	SEE: 3 hrs.

Course Objectives: The course will enable learners:	Course Outcomes: On completion of the course, students will be able to:
1. To gain understanding of working of banking companies	Examine and classify banking operations
2. To comprehend the Risk aspects Insurance Companies	Analyze the Risks involved in Insurance Business
3. To understand the concepts and applications of Financial instruments	Evaluate and invest in different financial assets available in the market
4. To gain understanding of Financial Markets infrastructure	Analyze the working of financial markets

Unit I: Banking: (8 hours)
Nature and Functions of commercial banks –Banking Assets and Liabilities - distribution channels in Wholesale and Retail banking –KYC and its importance in Banking – Role of Banks in Anti Money Laundering – Automated processing of payments – NEFT, RTGS, IMPS, SWIFT- Risks in Banking – Credit Risk, Interest Rate Risk, Liquidity risk and Frauds.

Unit II: Insurance (6 hours)
Concept- Principles – Functions of Insurance - Life Insurance – Products - Health and General Insurance - Products and Services - Eco system of Insurance– Insurance companies- Advisors- underwriters – TPAs - Actuaries - Reinsurance – Overview of IRDA

Unit III: Finance (8 hours)
Nature and concept of Equities – Common Shares – Preference equity - Primary Market and Secondary Market – Nature and Functions- Bonds – characteristics – Valuation – Hybrid Financial instruments.

Unit IV: Securities (5 hours)
Derivatives – Meaning - Uses – Types of Derivatives – Forwards – Futures- Options – Recent Trends in Derivative Trading, Financial Market

Infrastructure Institutions – Nature and Functions of Stock Exchanges , Depositories and Clearing Houses

Learning Resources for students:
M Y Khan, Financial Services, 10th Edition, Tata Mcgraw Hill
References:
www.sebi.gov.in
www.rbi.org.in

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal tests	:	2	Max. Marks	:	30
2	No. of assignments	:	3	Max. Marks	:	5
3	No. of Quizzes	:	3	Max. Marks	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Accredited by NAAC with A++ Grade
9-5-81, Ibrahimbagh, Hyderbad-500031
DEPARTMENT OF MATHEMATICS
NUMBER THEORY & BOOLEAN ALGEBRA
(OPEN ELECTIVE)
For B.E., III - Semester – CBCS
(Common to CSE, AIML & IT Branches)

Instruction :3 Hours per week	**Semester End Exam Marks: 40**	**Subject Reference Code: U24OE320MA**
Credits: 2	**Sessional Marks: 60**	**Duration of Semester End Exam: 3 Hours**

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to :	***At the end of the course students should be able to:***
1. ***Study*** Fundamental Theorem of Arithmetic and GCD using Euclidean Algorithm and also Linear Diophantine Equations and their solutions. **2.** ***Understand*** **the concepts of number theory such Congruences and proof of Chinese Remainder theorem.** **3.** ***Identify*** Primitive roots for primes and their existence and also to outline the Euler's theorem and Lagrange's theorem. **4.** ***Familiarize*** **with properties of Boolean algebra and to understand Normal Forms.**	**1.** ***Calculate*** GCD using Euclidean algorithm and also solve Linear Diophantine Equations in order to implement in RSA encryption. **2.** ***Apply*** Chinese Remainder theorem for optimizing cryptographic processes, such as accelerating RSA decryption and the Pollard Rho method to assess and demonstrate the factorization of composite numbers used in cryptographic keys. **3.** ***Use*** Fermat's Theorem & Wilson's theorem to prove that RSA works accurately and also in discrete log cipher of Cryptography. Also primitive roots in the Diffie-Hellman key exchange protocol of Cryptography **4.** ***Design*** secure hash functions, encryption schemes, and authentication protocols using Boolean functions which are the building blocks of symmetric cryptographic systems.

UNIT – I (6 Hours)

THEORY OF NUMBERS: The Integers and Division- Prime and Composite Numbers -Division Algorithm- Fundamental Theorem of Arithmetic(without

proof) –GCD and their properties- Euclidean Algorithm- Linear Diophantine Equations and their solutions.

UNIT – II (8 Hours)

CONGRUENCES: Modular Arithmetic- Introduction to Congruences, Linear Congruence. Chinese Remainder Theorem - System of Linear Congruences in two variables- The Pollard Rho Factoring Method.

UNIT – III (5 Hours)

SOME SPECIAL CONGRUENCES: Fermat's Little Theorem- Wilsons Theorem and its converse Euler's phi-function - Euler's theorem -The order of an integer modulo n, Primitive roots for primes.

UNIT – IV (6 Hours)

BOOLEAN ALGEBRA: Axiomatic definition of Boolean Algebra, Basic theorems and Properties of Boolean Algebra, Boolean Functions, Minterms and Maxterms, Disjunctive normal form and conjunctive normal form.

Text Books:

1. K.H. Rosen: Elementary Number Theory & its Applications, Pearson Addition Wesley
2. Elementary Number Theory | 7th Edition by David Burton, Mc Graw Hill Education
3. Discrete mathematics for computer scientists and mathematicians / by Joe L. Mott, Abraham Kandel and Theodore P. Baker, Prentice Hall Of India Pvt.Ltd., 1986.Edition: 2nd edition, New Delhi.
4. Discrete Mathematics, R.K.Bisht and H.S.Dhami, Oxford Higher Education.

Reference Books:

1. N. Koblitz; A course in Number theory and Cryptography; Springer.
2. Neville Robinns, Beginning Number Theory (2nd Edition), Narosa Publishing House Pvt. Limited, Delhi, 2007.
3. Elementary Number Theory with Applications, Thomas Koshy, 2nd edition, Academic Press, An Imprint of Elsevier, USA, 2007.
4. Basic Number Theory by S.B. Malik,S. Chand publishers
5. Arnold B. H.: Logic and Boolean Algebra, Prentice Hall, 1962.

Online Resources:

1. https://www.classcentral.com/course/openlearn-science-maths-technology-introduction-number-theory-95553
2. https://www.open.edu/openlearn/science-maths-technology/introduction-number-theory/content-section-0?intro=1
3. https://ocw.mit.edu/courses/6-042j-mathematics-for-computer-science-fall-2010/resources/lecture-4-number-theory-i/

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-24)

B.E. – INFORMATION TECHNOLOGY : THIRD SEMESTER (2025 - 2026)

B.E (IT) III-Semester (BRIDGE COURSE)								
Course Code	**Course Name**	**Scheme of Instruction**			**Scheme of Examination**			**Credits**
		Hours per week			**Duration in Hrs**	**Maximum Marks**		
		L	**T**	**P/D**		**SEE**	**CIE**	
THEORY								
UB24BS300MA	Foundation to Engineering Mathematics	2	-	-	3	50	-	-
UB24ES310IT	Problem Solving through Programming using C	2	-	-	3	50	-	-
PRACTICAL								
UB24ES311IT	Problem Solving through Programming using C Lab	-	-	2	3	50	-	-
	Total	**4**	**-**	**2**	**-**	**150**		
	Grand Total	**6+0=6**						

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Accredited by NAAC with A++ Grade
9-5-81, Ibrahimbagh, Hyderbad-500031, Telangana State
DEPARTMENT OF MATHEMATICS

FOUNDATION TO ENGINEERING MATHEMATICS

BRIDGE COURSE FOR B.E. III-SEMESTER (CBCS)
(Common to all branches)

L:T:P (Hrs./week): 2:0:0	SEE Marks: 50	Course Code: **UB24BS300MA**
Credits: Nil	CIE Marks: Nil	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to:	***At the end of the course students will be able to:***
1. ***Study*** the concepts of vector differentiation, Directional derivative, Divergence and Curl of a vector point function. 2. ***Understand*** the concepts of Descriptive Statistics. 3. ***Learn*** the basics of Set theory, Permutations and Combinations and Probability. 4. ***Understand*** the concept of Rank of a matrix, Echelon form, System of Linear Equations and Eigen Values and Eigen Vectors.	1. ***Solve*** problems on fitting of a straight line to the given data and also to find co-efficient of correlation and to determine regression lines and their application problems. 2. ***Apply*** the concepts of Descriptive Statistics to calculate Mean, Median, Mode, Measures of Dispersion, Mean Deviation and Standard Deviation. 3. ***Solve*** the problems on Permutations, Combinations and Probability. 4. ***Compute*** the Rank of a matrix and Eigen values and Eigen vectors of a matrix.

UNIT – I: CALCULUS

Differentiation of standard functions (Formulae) - Partial Derivatives – Scalar and Vector point functions -Vector Differentiation-Level Surfaces-Gradient of a scalar point function- Normal to a level surface- Directional Derivative – Divergence and Curl of a Vector field -Solenoidal and Irrotational vector

UNIT – II: DESCRIPTIVE STATISTICS

Mean-Median-Mode-Measures of Dispersion: Range-Mean Deviation-Standard Deviation

UNIT –III: BASICS OF PROBABILITY

Basics concepts of set theory - Permutations & Combinations - Random event & Experiment-Sample space - Classical definition of Probability - Axioms of probability.

UNIT – IV: MATRICES

Rank of matrix- Echelon form - System of Linear Equations- Consistency of Homogeneous and Non-homogeneous system of equations- Eigen values and EigenVectors.

TEXT BOOKS:

1 Advanced Engineering Mathematics, Third Edition, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.
2 Higher Engineering Mathematics, Dr.B.S. S Grewal 40th Edition, Khanna Publishers.
3 Fundamentals of Mathematical Statistics, S. C. Gupta, V.K. Kapoor, S Chand & Sons

VASAVICOLLEGEOFENGINEERING (AUTONOMOUS)
IBRAHIMBAGH,HYDERABAD– 500031
DEPARTMENT OF INFORMATION TECHNOLOGY

PROBLEM SOLVING THROUGH PROGRAMMING USING C

SYLLABUS FOR BRIDGE COURSE B.E. III-SEMESTER

L:T:P (Hrs./week): 2:0:0	SEE Marks : 50	Course Code:**UB24ES310IT**
Credits :--	CIE Marks : --	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Acquire problem solving skills 2. Develop flow charts 3. Understand structured programming concepts 4. Write programs in C Language	1. Design flowcharts and algorithms for solving a problem and choose appropriate data type for writing programs in C language 2. Design modular programs involving input output operations, decision making and looping constructs 3. Apply the concept of arrays for storing, sorting and searching data 4. Apply the concept of pointers for dynamic memory management and string handling 5. Design programs to store data in structures and files

UNIT-I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Flowcharts.

Introduction to C Language- Background, C Programs, Identifiers, Types, Variables, Constants, Input/Output, Expressions, Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion, Statements, Bitwise Operators.

UNIT-II

Selection: Logical Data and Operators, if… else, switch Statements, Standard Functions.

Repetition: Loops, while, for, do-while Statements, Loop Examples, break, continue, goto.

Functions: Designing Structured Programs, Functions Basics, User Defined Functions.

UNIT-III

Recursion-Recursive Functions, Preprocessor Commands.
Arrays: Two-Dimensional Arrays, Linear Search and Binary Search, Selection Sort and Bubble Sort.

UNIT-IV
Pointers: Introduction, Pointers to Pointers, Arithmetic operations using pointers
Strings – Concepts, C Strings, String Input/output, Functions, Arrays of Strings, String Manipulation Functions.

UNIT-V
Structure: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Unions.
Input and Output: Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Learning Resources:
1. B. A. Forouzan& Richard F. Gilberg, "A Structured Programming Approach using C", 3rd Edition, Cengage Learning, 2013.
2. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Prentice-Hall, 2006.
3. Rajaraman V, "The Fundamentals of Computer", 4th Edition, Prentice-Hall of India, 2006.
4. Steve Oualline, "Practical C Programming", 3rd Edition, O'Reilly Press.
5. Jeri R. Hanly, Elliot B. Koffman, "Problem Solving and Program Design in C", 5th Edition, Pearson Education, 2007.
6. E. Balagurusamy, "Programming in ANSI C", 4th Edition, TMG, 2008.
7. Gottfried, "Programming with C", 3rd Edition, TMH, 2010.
8. R G Dromey, "How to Solve it by Computer", 1st Edition, Pearson Education, 2006.

VASAVI COLLEGE OF ENGINEERING(AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF INFORMATION TECHNOLOGY

PROBLEM SOLVING THROUGH PROGRAMMING USING C LAB

SYLLABUS FOR BRIDGE COURSE B.E III SEMESTER

L:T:P (Hrs./week): 0:0:2	SEE Marks : 50	Course Code :**UB24ES311IT**
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students will be able to:***
1. Understand the fundamentals of programming in C Language 2. Write, compile and debug programs in C. 3. Formulate solution to problems andimplement in C. 4. Effectively choose programming components to solve computing problems.	1. Choose appropriate data type for implementing programs in C language. 2. Design and implement modular programs involving input output operations, decision making and looping constructs. 3. Implement search and sort operations on arrays. 4. Apply the concept of pointers for implementing prog rams on dynamic memory management and string handling. 5. Design and implement programs to store data in structures and files.

Programming Exercise:

1. Programs to illustrate arithmetic and bitwise operators
2. Programs to illustrate selection control statements
3. Programs to illustrate loop control statements.
4. Programs to illustrate functions and recursion
5. Programs to illustrate one dimensional arrays, searching and sorting.
6. Programs to illustrate two dimensional arrays
7. Programs on pointers
8. Program on usage of built-in Functions for string manipulations.
9. Programs on structures and unions.
10. File handling programs.

Learning Resources:

1. Forouzan B.A & Richard F. Gilberg, A Structured Programming Approach using C, 3rd Edition(2013),Cengage Learning.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2nd Edition (2006), Prentice-Hall.
3. Steve Oualline, Practical CProgramming,3rd Edition(2006),O'Reilly Press.
4. Balagurusamy E, Programming in ANSI C, 4th Edition(2008), TMG.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-24)
B.E. – INFORMATION TECHNOLOGY : FOURTH SEMESTER (2025 - 2026)

B.E (IT) IV Semester								
Course Code	**Course Name**	**Scheme of Instruction**			**Scheme of Examination**			
		Hours per week			**Duration in Hrs**	**Maximum Marks**		**Credits**
		L	**T**	**P/D**		**SEE**	**CIE**	
U24BS420MA	Probability and Statistics	3	-	-	3	60	40	3
U24PC410IT	Computer Organization	3	-	-	3	60	40	3
U24PC420IT	Database Management Systems	3	-	-	3	60	40	3
U24PC430IT	Design & Analysis of Algorithms	3	-	-	3	60	40	3
U24PC440IT	Full Stack Development	3	-	-	3	60	40	3
U24OE4XXXX	Open Elective – II	3	-	-	3	60	40	3
U24HS030EH	Human Values and Professional Ethics – II	1	-	-	2	40	30	1
U24BS430MA	Skill Development Course – III (Aptitude)	1	-	-	2	40	30	1
U24PE410IT	Skill Development Course - IV (Technical Skills- II)	1	-	-	2	40	30	1
PRACTICALS								
U24PC421IT	Database Management Systems Lab	-	-	2	3	50	30	1
U24PC431IT	Design and Analysis of Algorithms Lab	-	-	2	3	50	30	1
U24PC441IT	Full Stack Development Lab	-	-	2	3	50	30	1
	Co-Curricular Activities-I	-	-	-	-	-	-	-
	Library /Sports/ Mentor Interaction	**-**	**-**	**-**	**-**	**-**	**-**	**-**
• Student should acquire one NPTEL Certification Course equivalent to 2 credits (8 weeks) by the end of VI Semester. • Students opting for Honours should complete one NPTEL Course of 2 credits (8 Weeks) by the end of IV Semester.								
	Total	**21**	**-**	**6**	**--**	**630**	**420**	**24**
	Grand Total	**27**			**--**	**1050**		

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
9-5-81, Ibrahimbagh, Hyderbad-500031, Telangana State
DEPARTMENT OF MATHEMATICS

PROBABILITY & STATISTICS

For B.E., IV- Sem., (CBCS)
(For IT Branch only)

L:T:P(Hrs./week): 3:0:0	Sem. End Exam Marks: 60	Subject Reference Code: **U24BS420MA**
Credits : 3	Sessional Marks:40	Duration of Semester End Exam : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to :	***At the end of the course students should be able to:***
1. ***Study*** the fundamental concepts of probability theory. **2.** ***Understand*** random variables and its probability distributions. **3.** ***Learn*** various probability distributions, and their related applications. **4.** ***Study*** the concept of hypothesis testing employed for large samples. **5.** ***Study*** the various methods of testing small samples.	**1.** ***Define*** probability and compute probabilities of events and apply Baye's Theorem to update probabilities based on new information. **2.** ***Differentiate*** between discrete and continuous random variables and its distributions. **3.** ***Apply*** various theoretical probability distributions to solve related problems in various applications. **4.** ***Formulate*** Null and Alternative Hypotheses and apply the tests of hypothesis for large samples. **5.** ***Apply*** various methods for Tests of Significance for small samples.

UNIT –I : PROBABILITY:
Basic terminology- Definition of Probability – Addition Law of probability- Independent events- Conditional Probability- Multiplication law of probability - Baye's Theorem.

UNIT –II : RANDOM VARIABLES AND DISTRIBUTIONS:
Random Variables - Discrete and Continuous Random Variables – Mass and density functions – Cumulative distribution functions - Definitions of Mean, Median, Mode and Variance of Probability distributions.

UNIT-III : THEORETICAL DISTRIBUTIONS: Binomial & Poisson distributions & Normal Distribution- Properties-related problems

UNIT-IV : TESTS OF HYPOTHESIS FOR LARGE SAMPLES:

Introduction -Testing of Hypothesis- Null and Alternative Hypothesis -Errors- - Level of Significance –Confidence Intervals - One and two tailed tests - Tests of Significance for large samples – Tests for single mean- Difference of means.

UNIT - V : TESTS OF HYPOTHESIS FOR SMALL SAMPLES:

Tests of Significance for small samples - t-test for single mean and difference of means – F- test for comparison of variances - Chi-square test for goodness of fit.

Text Books:

1 Advanced Engineering Mathematics, Third Edition, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.

2 Higher Engineering Mathematics, Dr.B.S. S Grewal 40th Edition, Khanna Publishers.

3 Probability & Statistics and Random Process, Third edition, T Veerarajan, Tata McGraw-Hill publishing limited.

Reference Books:

1. Miller & Freund's Probability And Statistics For Engineers, Ninth Edition, Richard A. Johnson, Pearson publishers.
2. A text book of Engineering Mathematics by N.P. Bali & Manish Goyal, Laxmi Publication.
3. Fundamentals of Mathematical Statistics, Gupta & Kapoor, Sultan chand & sons, New Delhi.
4. Probability & Statistics for Engineers, Antony J. Hayter, CENGAGE Learning.

Online Resources:

1 https://onlinecourses.nptel.ac.in/noc24_ma39/preview

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER ORGANIZATION

SYLLABUS FOR IV-SEMESTER

L:T:P(Hrs./week): 3:0:0	SEE Marks :60	Course Code : **U24PC410IT**
Credits : 3	CIE Marks :40	Duration of SEE : 3 Hours

COURSE OBJECTIVES The Objectives of the course:	**COURSE OUTCOMES** *On completion of the course, students will be able to:*
1. Provide the fundamentals of Computer Organization, basic processing units. 2. Explain input and output interfacing, memory and pipelining concepts.	1. Understand fundamentals of computer organization and instruction formats. 2. Analyse operations of arithmetic, logic, shift and control units. 3. Identify peripheral devices and analyse modes of data transfer. 4. Analyse the efficiency of cache, main memory and secondary storage. 5. Apply pipelining process to address structural, data and control hazards.

UNIT – I
Basic Structure of Computers :
Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Memory locations and Addresses, Memory operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly language, Additional Instructions

UNIT – II
Basic Processing Unit:
Register Transfer Language and Micro operations: Register Transfer Language, Register Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic logic shift unit.
MICROPROGRAMMED CONTROL: Control memory, address sequencing, micro program example, Design of control unit, hardwired control, micro programmed control.

UNIT – III
Input Output Organization:
Peripheral devices, Input-output Interface, Asynchronous Data Transfer, Modes of Transfer, and Priority interrupt, Direct Memory Access.

UNIT – IV

Memory System

Some Basic Concepts, Semiconductor RAM Memories, Read-Only memories, Cache Memories, Performance considerations, Virtual Memories, Memory Management Requirements, Secondary Storage-Magnetic Hard disks, Optical Disks, Magnetic Tape Systems

UNIT – V

Pipelining:

Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction sets, Data path and control considerations, Super Scalar Operation.

Flynn's Classification of computers: SISD, SIMD, MISD, MIMD.

Learning Resources:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, McGraw Hill, 2002.
2. M. M. Mano, Computer System Architecture, 3rd Edition, Prentice Hall, 1994.
3. W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India, 2002.
4. J .P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.
5. Pal Chouduri, Computer Organization and Design, 2nd Ed. Prentice Hall of India, 2007
6. D. A. Patterson and J. L. Hennessy, "Computer Organization and Design - The Hardware/Software Interface", 2005.
7. https://nptel.ac.in/courses/106106092/

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:		30
2	No. of Assignments:	03	Max. Marks for each Assignment:		05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:		05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

DATABASE MANAGEMENT SYSTEMS

SYLLABUS FOR IV-SEMESTER

L:T:P(Hrs./week): 3:0:0	SEE Marks :60	Course Code : **U24PC420IT**
Credits : 3	CIE Marks :40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The Objectives of the course:	*On completion of the course, students will be able to:*
1. Explain the concepts of database management systems. 2. Demonstrate conceptual and logical database design. 3. Explain the essential DBMS concepts like database security, integrity, concurrency, NoSQL databases.	1. Identify the functional components of the DBMS, develop ER model for a given problem and map ER to Relational model. 2. Formulate relational database principles using Relational Algebra and SQL Queries. 3. Design a normalized database schema using different normal forms. 4. Understand transaction processing and compare different concurrency control and recovery techniques. 5. Understand NoSQL databases like HBase, Firebase, MongoDB, Cloud DB.

UNIT – I

Introduction to DBMS: Overview, File system vs DBMS, Advantages of DBMS, Database System Applications, Relational Databases, Object – Based and Semi-structured Databases, Data Storage and Querying, Database Architecture, Database Users and Administrators.

Database Design and the E-R Model: Overview of the Design Process, The E-R Model, Constraints, E-R Diagrams, E–R Design Issues, Weak Entity Sets, Extended E-R Features.

UNIT – II

Relational Model: Structure of Relational Databases, Reduction to Relational Schemas, Other Aspects of Database Design. Relational Algebra: Fundamental Relational-Algebra Operations, Additional Relational – Algebra Operations, Extended Relational -Algebra Operations, Null Values, Modification of the Databases.

Structured Query Language: Data Definition, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Complex Queries, Views, Joined Relations, Indexing: Basic Concepts, Bitmap Indices, Index Definition in SQL.

UNIT – III

Advanced SQL and PLSQL: SQL Data Types and Schemas, Integrity Constraints, Authorization, SQL functions, procedural SQL, embedded SQL, cursors, ODBC and JDBC, triggers.

Schema Refinement: Features of Good Relational Design, Functional-Dependency Theory, Decomposition Using Functional Dependencies, Normalization, First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form, Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT – IV

Transactions: ACID properties, Transaction States, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Testing for serializability.

Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes, Deadlock Handling.

Recovery System: Failure Classification, Storage Structure, Log-Based Recovery, Aries, Media recovery.

UNIT – V

NoSQL: Introduction to NOSQL, NoSQL Vs RDBMS, Categories of NoSQL Databases, Case studies: HBase, Firebase, MongoDB, Cloud DB.

Learning Resources:

1. Abraham Silberschatz, Henry F Korth, S. Sudarshan, Database System Concepts, 6th Edition, McGraw-Hill International Edition, 2011.
2. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, Third Edition, McGraw-Hill International Edition, 2003.
3. Elmasri, Navathe, Somayajulu and Gupta, Fundamentals of Database System, 6th Edition, Pearson Education, 2011.
4. Patric O'Neil, Elizabeth O'Neil, Database-principles, programming, and performance, Morgan Kaufmann Publishers, 2001.
5. Peter Rob, Carlos coronel, Database Systems, (2007), Thomoson.
6. https://nptel.ac.in/courses/106105175/

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

DESIGN AND ANALYSIS OF ALGORITHMS

SYLLABUS FOR B.E IV-SEMESTER

L:T:P(Hrs./week): 3:0:0	SEE Marks : 60	Course Code : **U24PC430IT**
Credits : 3	CIE Marks : 40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The Objectives of the course:	*On completion of the course, students will be able to:*
1. Explain Asymptotic notations, time and space complexity analysis. 2. Discuss different algorithm design strategies and their applications. 3. Introduce NP-Hard and NP-Completeness concepts.	1. Understand asymptotic notations and analyze the complexity of recursive and non-recursive algorithms. 2. Illustrate divide & conquer and greedy algorithm design strategies. 3. Apply dynamic programming strategy to solve optimization problems. 4. Solve problems using backtracking and branch and bound. 5. Understand NP hard and NP completeness

UNIT-I

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method, Amortized analysis, Disjoint Set-union-find, merge-find.

UNIT-II

Divide and conquer: The general method, Iterative and Divide and conquer for Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication Algorithm Masters' theorem.

Greedy Method: The general method, Knapsack problem, Job sequencing with deadlines, Optimal storage on tapes, Optimal merge patterns, Huffman Codes, Dijikstra's algorithm.

UNIT-III

Dynamic Programming: The general method, Bellman-Ford Algorithm, Multistage graph, All-Pairs Shortest Paths, Matrix chain multiplication, Optimal Binary Search trees, 0/1 Knapsack, Reliability design, Traveling Salesman Problem.

UNIT-IV

Backtracking: The general method, 8-Queens Problem, Graph Coloring, Hamiltonian cycles, Knapsack Problem

Branch and Bound: The general method, 0/1 Knapsack Problem, Traveling salesperson problem

UNIT-V

NP-Hard and NP-Completeness: Basic concepts, NP-hard graph problems- Clique Decision Problem, Node Cover Decision Problem, NP-Hard Scheduling Problem - scheduling identical processors, NP-Hard code scheduling problems – Code generation with common sub-expression.

Learning Resources:

1. Ellis Horowitz, Sartaj Sahani, Sanguthevar Rajasekaran," Fundamentals of computer Algorithms", Second edition (2008),Universities Press
2. Thomas H. Cormen, Leiserson C.E, Rivest.R.L , Stein.C, Introduction to Algorithm, 2nd edition (2001), MIT press, USA.Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson,
3. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
4. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
5. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.
6. https://nptel.ac.in/courses/106101060/
7. https://ocw.mit.edu/courses/electrical-engineering-and-computerscience/6-006-introduction-to-algorithms-fall-2011/lecture-videos

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:		30
2	No. of Assignments:	03	Max. Marks for each Assignment:		05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:		05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

FULL STACK DEVELOPMENT

SYLLABUS FOR B.E IV- SEMESTER

L:T:P (Hrs./week):: 3:0:0	SEE Marks : 60	Course Code: **U24PC440IT**
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
The Objectives of the course:	*On completion of the course, students will be able to:*
1. Provide basic skills for designing static and dynamic Web Applications using HTML, CSS, Java script & frame works like Bootstrap 2. Demonstrate how to design and develop web applications using SpringBoot, Node JS, React and Mongo DB.	1. Design static web pages using HTML and CSS. 2. Create dynamic web pages with client-side validations using XML and JavaScript. 3. Develop responsive web applications using Bootstrap and SpringBoot framework. 4. Build cross-platform single page applications using React. 5. Develop web applications using Node.js and MongoDB.

UNIT-I

Introduction: World Wide Web, Web Browsers, Web Servers, URL, HTTP, TCP Port.

HTML & CSS: Standard HTML document structure, Basic Tags, Images, Hypertext Links, Lists, Tables, Frames. Introduction to Cascading style sheets.

UNIT-II

JavaScript: Introduction, Basics of JavaScript-variables, data types and operators, Control Structures, Arrays, Functions, HTML Forms, Events and event handling, Asynchronous JavaScript

XML : XML: The Syntax of XML, XML Document Structure, Document Type Definitions.

UNIT-III

Bootstrap: The Grid system, Layout components: Tables, Images, alerts, buttons, badges, progress bars, cards, drop downs, pagination, Collapse, Navbar, carousel.

SpringBoot: Introduction to Spring, SpringBoot Architecture, Installation of SpringBoot- Spring Initializr, building a web application using StringBoot, Dependency Injection, Database connectivity using SpringBoot.

UNIT-IV

React

Introduction to React, Add React to a website, create a new React App, Introducing JSX, Rendering Elements, Components and Props, State and Lifecycle, Handling Events, Conditional Rendering, Lists and Keys, Forms. Building Single-Page applications with React.

UNIT-V

Application using Node JS and MongoDB:

Introduction to Node.js-Installing Node.js- Using Events, Listeners, Timers, and Callbacks in Node.js, Introduction to Mongo DB - Accessing MongoDB from Node.js

Learning Resources:

1. Robert W. Sebesta, Programming the World Wide Web, 7th Edition (2014), Pearson Education.
2. "Web Technologies", 7th Edition, Uttam K.Roy,2012.
3. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, Internet & World Wide Web How to Program, 5th Edition, Pearson Education.
4. Learning React Functional Web Development with React and Redux by Alex Banks, Eve Porcello, Alex Banks, Eve Porcello
5. Pro MERN Stack Full Stack Web App Development with Mongo, Express, React and Node 2nd Edition, Vasan Subramaniam
6. Greg L.Turnquist, Learning SpringBoot 3.0, 3rd Edition, 2022
7. Craig Walls, SpringBoot in Action, Manning Publications, 2016
8. http://getbootstrap.com/
9. https://reactjs.org/
10. https://nodejs.org/en/

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:		30
2	No. of Assignments:	03	Max. Marks for each Assignment:		05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:		05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

HUMAN VALUES AND PROFESSIONAL ETHICS-II

(Common to all branches)
SYLLABUS FOR B.E. 2/4 - III & IV SEMESTER

L:T:P (Hrs./week):: 1:0:0	SEE Marks : 40	Course Code: **U24HS030EH**
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES **The course will enable the learners to:**	**COURSE OUTCOMES** **At the end of the course the learners will be able to: -**
1. Create an awareness on the interrelation between Society, Ethics and Human Values 2. Understand how ethical dilemmas apply to real life scenarios 3. Develop ethical human conduct and professional competence 4. Understand the role of good ethical practices and apply it in a project	1. Identify ethical risks in everyday life and in societies that can lead to unethical choices, such as structures that diffuse responsibility or a group that has collectively de-stigmatized unethical behaviour 2. Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, and the objective presentation of data. 3. Assess their own ethical values and the social context of problems and articulate what makes a particular course of action ethically defensible 4. Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research

UNIT1 - NORMATIVE ETHICS & SOCIETAL ETHICS

This unit deals with normative ethics, the branch of moral philosophy, or ethics, concerned with criteria of what is morally right and wrong. It includes the formulation of moral rules that have direct implications for what human actions, institutions, and ways of life should be like. This unit also covers societal ethics

which is the systematic reflection on the moral dimensions of social structures, systems, issues, and communities.

1.1 Ethical Decision-Making Frameworks
1.2 Emerging Ethical Challenges
1.3 Building a Just Society

UNIT 2 - PROFESSIONAL ETHICS - NEED FOR ETHICAL CODES

This unit covers the code of Professional Ethics- it is designed to ensure that students learn the necessary skills that groom them to behave like employees should, one that is socially acceptable and respectful of one another. It establishes the rules for behavior and sends a message to every employee that universal compliance is expected.

2.1 The Importance of Ethical Conduct
2.2 Personal & Professional Accountability
2.3 Maintaining Public Confidence
2.4 Understanding Ethical Codes

UNIT 3 - PRIVACY

This unit covers "Cyber ethics" - the code of responsible behavior on the Internet. Just as we are taught to act responsibly in everyday life with lessons such as "Don't take what doesn't belong to you" and "Do not harm others," we must act responsibly in the cyber world as well.

The basic rule is "Do not do something in cyberspace that you would consider wrong or illegal in everyday life."

3.1 Defining Privacy
3.2 Privacy in the Digital Age
3.3 The Ethics of Surveillance

UNIT 4- Engineering Ethics for Future Innovators

This unit equips students, the future innovators of tomorrow, with a foundation in engineering ethics. Students will explore the ethical responsibilities engineers hold regarding safety, public well-being, and sustainability. Real-world scenarios and case studies will be examined to understand how ethical considerations impact engineering decisions.

4.1 Safety and Public Welfare
4.2 Sustainability and Environmental Impact
4.3 The Ethics of New Technologies

MODE OF DELIVERY

• **Questionnaires** • **Quizzes** • **Case-studies** • **Observations and practice** • **Home and classroom assignments**	• **Discussions** • **Skits** • **Short Movies/documentaries** • **Team tasks and individual tasks** • **Research based tasks** • **Project**

Relevant Websites, CD's and Documentaries

- https://plato.stanford.edu/

Learning Resources:

- learn.talentsprint.com

1. Moral Machines: Ethical Robotics and Artificial Intelligence by Wendell Wallach
2. Thinking Like an Engineer: Studies in the Ethics of a Profession by Paul Dufour
3. Engineering Ethics: Contemporary and Enduring Debates by Deborah G. Johnson
4. Engineering Ethics: Concepts and Cases by Charles E. Harris, Michael S. Pritchard, Michael J. Rabins, Ray James, and Elaine Englehardt

Additional Reading

1. Akash Singh Rathore - On Constitution

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal tests	:	1	Max. Marks	:	20
2	No. of assignments	:	2	Max. Marks	:	5
3	No. of Quizzes	:	2	Max. Marks	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF MATHEMATICS

SKILL DEVELOPMENT COURSE- III : (APTITUDE)

(Common to CSE, CSE-AIML & IT)
SYLLABUS FOR B.E. IV SEMESTER

L: T: P (Hrs/Week): 1:0:0	SEE Marks: 40	Course Code: **U24BS430MA**
Credits: 1	CIE Marks: 30	Duration of SEE: 02 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the learners to: 1. Students will be trained to enhance their employability skills. 2. Students will be introduced to higher order thinking and problem solving skills in the following areas - Arithmetic Ability, Numerical Ability and General Reasoning. 3. Students will be trained to work systematically with speed and accuracy while problem solving. 4. Students will be trained to apply concepts like percentages and averages to solve complex problems. 5. Students will be trained to use effective methods like elimination of options and shortcuts to solve problem accurately.	**At the end of the course the learners will be able to: -** 1. Solve questions in the mentioned areas using shortcuts and smart methods. 2. Understand the fundamentals concept of Aptitude skills. 3. Perform calculations with speed and accuracy. 4. Solve complex problems using basic concepts. 5. Use shortcuts with ease for effective problem solving.

UNIT 1
QUANTITATIVE APTITUDE- ARITHMETIC ABILITY ADVANCED -1
1.1 Time speed and distance
1.2 Boats and Streams
1.3 Problems on trains

UNIT 2
REASONING ABILITY- LOGICAL REASONING
2.1 Seating Arrangements- Linear; Circular; Complex
2.2 Venn diagrams
2.3 Syllogism
2.4 Cubes & Cuboids
2.5 Dices

UNIT 3
REASONING ABILITY- NON VERBAL REASONING

3.1 Figure Series
3.2 Directions
3.3 Clocks
3.4 Calendars

UNIT 4
QUANTITATIVE APTITUDE- ARITHMETIC ABILITY ADVANCED -2
4.1 Mensuration Part -1
4.2 Mensuration Part -2
4.3 Logarithms

UNIT 5
QUANTITATIVE APTITUDE- ENGINEERING MATHEMATICS
5.1 Permutations and combinations
5.2 Probability

Learning Resources :
Prescribed textbook for theory:

1. Quantitative Aptitude S.CHAND by RS AGARWAL
2. A Modern Approach to Verbal & Non-Verbal Reasoning S.CHAND by Dr. R S Aggarwal

Suggested Reading

1. Learn.talentsprint.com/References Courses
2. Quantitative Aptitude Disha Publications
3. LOGICAL Reasoning Disha Publications

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal tests	:	2	Max. Marks	:	20
2	No. of assignments	:	2	Max. Marks	:	5
3	No. of Quizzes	:	2	Max. Marks	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

SKILL DEVELOPMENT COURSE- VI : (TECHNICAL SKILLS- II)

SYLLABUS FOR IV-SEMESTER

L:T:P (Hrs./week): 1:0:0	SEE Marks :40	Course Code : **U24PE410IT**
Credits : 1	CIE Marks :30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The Objectives of the course:	*On completion of the course, students will be able to:*
❖ Understand the Nonlinear data structures and their applications. ❖ Prepare the students for the contests relative to the concepts learnt. ❖ Build confidence in coding using Non Linear Data structures ❖ Leverage the Industry Standards of the DBMS concepts	1. Lean non-linear data structures with various applications that are essential for solving problems which involve complex relationships, efficient searching, and hierarchical organization. 2. Solve scenario based problems using Tree Data structures. 3. Learn and apply greedy algorithms for efficient solutions to complex problems. 4. Learn and apply database concepts for designing efficient, reliable, and well-structured databases that meet the needs of modern applications.

Phase II

#7: Problem Solving through Non-Linear Data structures – Trees I

Problem solving approaches using Non-linear data structures, Coding problems on the height of a binary tree, Size of a binary tree, Tree order traversals, Problem Solving on Binary Trees, Examples, Practice problems

#8: Problem Solving through Non-Linear Data structures – Trees II

Time comparison and analysis on Binary Search Trees & Coding problems, Search/probe sequence validation, Significance of height balancing the tree, Examples, Practice problems

#9: Problem Solving implementing Algorithms - Greedy Methods II

Algorithmic Thinking, Selection as Greedy Strategy, Heaps Min and Max, Priority Queues, Greedy Coin change solution, Examples, Practice problems.

#10: Problem Solving implementing Algorithms - Greedy Methods II

Fractional Knapsack, Sequencing jobs with deadlines, Activity selection, Examples, Practice problems

#11: Problem Solving using DBMS I

Industry Standards of leveraging DBMS concepts: SQL Queries, Entity Relationship Models, Question, and answers

#12: Problem Solving using DBMS II

Industry Standards of leveraging DBMS concepts: Query Optimization,Transactions & Concurrency, Normalization, case studies, Question and answers

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

DATABASE MANAGEMENT SYSTEMS LAB

SYLLABUS FOR B.E. IV SEMESTER

L:T:P(Hrs/week): 0:0:2	SEE Marks :50	Course Code: **U24PC411IT**
Credits : 1	CIE Marks :30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The Objectives of the course:	*On completion of the course, students will be able to:*
Demonstrate SQL and PL/SQL constructs to develop a database application.	1. Design and implement a database schema. 2. Implement queries using SQL commands and SQLite. 3. Develop application programs using PL/SQL. 4. Develop a 2-tier Database Application.

1. **DDL Commands:**
   a. Creation of tables with appropriate integrity constraints
   b. Usage of alter, drop commands

2. **DML Commands:**
   a. Data Insertion and Updating
   b. Usage of truncate command

3. **TCL and DCL Commands:**
   a. Setting privileges
   b. save point, commit and rollback commands

4. **SQL Queries:**
   a. Simple SQL queries using Select
   b. SQL Built-in functions
   c. SQL Operators and Nested queries

5. Joins and aggregate functions
6. Grouping and ordering commands

7. **PL/SQL:**
   a. Blocks, Select Statement and control statements
   b. Stored procedures and functions
8. a. Packages and Exception Handling
   b. Cursors

c. Triggers

9. SQLite: Simple Application Development using SQLite (DDL,DML Operations on SQLite).
10. Creation of full-fledged Database Application.

Virtual Lab:

11. ER Modelling from the given problem statements: http://vlabs.iitkgp.ac.in/se/4/exercise/

Learning Resources:

1. Ivan Bayross, SQL, PL/SQL, The Programming Language of Oracle,4th Edition, PBP Publications. Reference Books 1. NileshShah, Database Systems Using Oracle, 2nd Edition(2007), PHI.
2. Rick F Van der Lans, Introduction to SQL, 4thEdition(2007), Pearson Education.
3. Benjamin Rosenzweig Elena Silvestrova, Oracle PL/SQL by Example, 3rdEdition(2004), Person Education.
4. Albert Lulushi, Oracle Forms Developer's Handbook, 1st Edition(2006), Pearson Education.
5. https://www.sqlite.org/index.html
6. https://www.lynda.com/Accesstutorials/Welcome/195854/373426-4.html

No. of Internal Tests:	02
Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work	18

Duration of Internal Test: **2 Hours**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

DESIGN AND ANALYSIS OF ALGORITHMS LAB

SYLLABUS FOR B.E. IV SEMESTER

L:T:P (Hrs/week):0:0:2	SEE Marks : 50	Course Code : **U24PC421IT**
Credits : 1	CIE Marks : 30	Duration of SEE: 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The Objectives of the course:	*On completion of the course, students will be able to:*
Develop skills in design and implementation of abstractions of various algorithm strategies and their practical applications.	1. Apply divide and conquer approach to solve searching and sorting problems. 2. Design and implement algorithms using Greedy strategy for the problems; Fractional knapsack, Huffman codes, shortest path finding (Dijkstra's algorithm). 3. Use Dynamic programming approach to solve problems including, shortest path finding (Bellman ford algorithm, All pair shortest path), Matrix chain multiplication, 0/1 Knapsack problem. 4. Solve N-Queens problem and Graph colouring problem using Backtracking approach. 5. Implement Branch & Bound algorithm for 0/1 Knapsack problem and Travelling Salesman problem.

1) A) Implement a stack using a linked list such that the push and pop operations of stack still take O(1) time.
   B) Implement a queue using a linked list such that the enqueue and dequeue operations of queue take O(1) time
2) Implement Linear Search, Binary Search and Hashing.
3) Implement a parallelized Merge Sort algorithm and Quick sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. Program to be executed for various sizes of input. Fill the given table. Obtaining a constant value in the column "time taken" would prove that the complexity of merge sort is same in all case.

Size	Ascending		Descending		Random Order	
	Input	Time taken	Input	Time taken	Input	Time taken
4						
8						
16						
32						

4) Implement Knapsack Algorithm using Greedy Strategy.
5) Implement optimal merge patterns – Huffman encoding algorithm.

6) From a given vertex in a weighted connected graph, find single source shortest path to other vertices using a) Dijikstra's algorithm b) Bellman ford algorithm.
7) Implement Matrix –chain multiplication algorithm using dynamic programming.
8) Implement All-pairs shortest path algorithm.
9) Implement 0/1 Knapsack algorithm.
10) Implementation of N-queens problem using back tracking.
11) Implement Graph coloring problem using back tracking.
12) Develop a program to check whether a given graph is connected or not using DFS method.
13) Implement 0/1 knapsack using branch and bound.
14) Implement Travelling salesman problem using branch and bound.

Virtual Lab:

15) Dijktra's Algorithm: https://ds2-iiith.vlabs.ac.in/exp/dijkstra-algorithm/index.html
16) Merge Sort & Quick Sort: https://ds1-iiith.vlabs.ac.in/exp/merge-sort/index.html

Learning Resources:

1. Ellis Horowitz, Sartaj Sahani, Sanguthevar Rajasekaran," Fundamentals of computer Algorithms", Second edition (2008),Universities Press
2. Thomas H. Cormen, Leiserson C.E, Rivest.R.L , Stein.C, Introduction to Algorithm, 2nd edition (2001), MIT press, USA.Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson,
3. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
4. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
5. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.
6. B.A.Forouzan & Richard F.Gilberg, "A Structured Programming Approach using C" 2nd Edition, Cengage Learning, 2007.
7. Mark A Weiss, Data Structures and Algorithm Analysis In C, Second Edition(2002), Pearson
8. https://ocw.mit.edu/courses/electrical-engineering-and-c: omputerscience/6-006-introduction-to-algorithms-fall-2011/lecture-videos
9. http://nptel.ac.in/courses/106106127/
10. http://www.nptel.ac.in/courses/106102064

No. of Internal Tests: 02
Max. Marks for Internal Test: 12
Marks for day-to-day laboratory class work 18
Duration of Internal Test: **2 Hours**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

FULL STACK DEVELOPMENT LAB

SYLLABUS FOR B.E IV- SEMESTER

L:T:P (Hrs./week):: 0:0:2	SEE Marks : 50	Course Code:**U24PC431IT**
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hrs

Course Objective:	**Course Outcomes:**
The Objectives of the course:	*On completion of the course, students will be able to:*
Demonstrate the frameworks and technologies to design and develop web applications.	1. Design and develop Web pages using HTML, CSS, javascript. 2. Develop Responsive web pages using frameworks. 3. Develop applications using SpringBoot. 4. Develop web applications using React, Node JS and MongoDB

I-HTML:

- Creation of HTML Document using basic tags.
- Creation of Menu using ordered and unordered list and other options.
- Creation of web page using table tags and their attributes
- Creation of web page using frames.
- Creation of document using CSS.

II-JAVASCRIPT & XML:

- Basic javascript programs using control statements, arrays and functions.
- Write a java script to validate the following fields in a registration page
  i) Name (should contains alphabets and the length should not be less than 6 characters)
  ii) Password(should not be less than 6 characters)
  iii) E-mail(should not contain invalid addresses)
- Creation of XML document and validating it using DTD

III-BOOTSTRAP

- Design Responsive web pages using Bootstrap.

IV- SpringBoot Framework

- Develop a web based application to perform Registration and Login using SpringInitilizr
- Create a SpringBoot application to perform basic CRUD (Create/ Read / Update/ Delete) operations using MongoDB.

V-NODE JS, REACT and MONGODB

- Develop web application using Node JS, React and Mongo DB

Virtual Lab:

Basics of HTML: https://html-iitd.vlabs.ac.in/List%20of%20experiments.html

Learning Resources:

1. Robert W. Sebesta, Programming the World Wide Web, 7th Edition (2014), Pearson Education.
2. "Web Technologies", 7th Edition, Uttam K.Roy,2012.
3. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, Internet & World Wide Web How to Program, 5th Edition, Pearson Education.
4. Learning React Functional Web Development with React and Redux by Alex Banks, Eve Porcello, Alex Banks, Eve Porcello
5. Pro MERN Stack Full Stack Web App Development with Mongo, Express, React and Node 2nd Edition, Vasan Subramaniam
6. Greg L.Turnquist, Learning SpringBoot 3.0, 3rd Edition, 2022
7. Craig Walls, SpringBoot in Action, Manning Publications, 2016
8. http://getbootstrap.com/
9. https://reactjs.org/
10. https://nodejs.org/en/

No. of Internal Tests:	02
Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work	18
Duration of Internal Test: **2 Hours**	

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
ACCREDITED BY NAAC WITH 'A++' GRADE
IBRAHIMBAGH, HYDERABAD – 500 031

OPEN ELECTIVES – II		
Department	**Code**	**Title**
Civil	U24OE410CE	Solid Waste Management
CSE	U24OE410CS	Basics Of Java Programming
CSE	U24OE420CS	Mathematical Computing for AI&ML with Python (Stream: Artificial Intelligence & Machine Learning)
MECH	U24OE420ME	Operations Research
MECH	U24OE410ME	Kinematics and Dynamics of Robotics (Stream: Robotics)
IT	U24OE410IT	Object Oriented Programming using Java
IT	U24OE420IT	Essentials of Mathematics for Machine Learning using Python (Stream: AI&ML)
EEE	U24OE410EE	Mathematical Programming for Numerical Computation
MATHS	U24OE410MA	Numerical Methods
H&SS	U24OE450EH	Fintech (Stream: Banking, Finance, Securities and Investments)
H&SS	U24OE410EH	Finance Management for Engineers (Stream: Management Courses for Engineers)
Mathematics	U24OE410MA	Numerical Methods
Mathematics	U24OE420MA	Algebraic Structures

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

SOLID WASTE MANAGEMENT (Open Elective-II)

SYLLABUS FOR B.E.IV-SEMESTER

L:T:P(Hrs./week):3:0:0	SEE Marks:60	Course Code:U24OE410CE
Credits: 3	CIE Marks:40	Duration of SEE : 3Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
In this subject the students will	Upon the completion of this course students will be able to
1. Understand characteristics of solid waste and legislation of solid waste management. 2. Understand processing, collection and transportation of solid wastes. 3. Gain insight into transformation, energy recovery and disposalof solid waste. 4. Grasp the fundamentals ofhazardous waste and its management. 5. Understand the solid waste management practices adoptedactual practical scenarios.	1. Understand types, characteristics, composition of solid waste and rules laid for its managementas per legislation. 2. Apply gained knowledge of waste reduction methods, collection techniques, resource recovery/recycling, energy recovery, transport & transfer options for solid waste management. 3. Identify appropriate technologies for transformation and disposal of solid waste. 4. Categorize solid waste as hazardous or non- hazardous based on solid waste toxicology principles. 5. Analyze and apply solid waste management techniques in actual practice.

UNIT- I: Solid waste generation and material flow, sources and types of solid waste,characterization of solid waste, physical and chemical properties of solid waste, Hierarchy of solid waste management, solid waste management rules-2016.

UNIT- II: Storage of solid waste, Collection of Solid Waste: Primary and secondary collection, type of waste collection systems- Hauled and Stationary collection system, Waste handling and Processing: unit operations used for separation and processing, materials recovery,Transfer and Transport of solid waste, transfer station.

UNIT-III: Solid waste transformation:aerobic and anaerobic composting,combustion,Thermal conversion- Incineration and pyrolysis system, Gasification, RDF- recovery of energy from conversion products. Energy recovery

systems, Solid waste disposal- Land farming, deep well injections, Landfills: Site selection, method, drainage and leachate collection systems, requirements and technical solutions.

UNIT–IV: Definition and identification of hazardous wastes,toxicology principles, sources and characteristics, hazardous wastes in Municipal Waste, Hazardous waste management, Introduction of Biomedical waste and E-waste, Hazardous waste regulations.

UNIT –V: Integrated solid waste management, Overview of solid waste management practices- National and International- Case studies, solid waste management practices adopted in industries- overview and case studies. Technological advancements in solid waste management.

Learning Resources:

1. P. A. Vesilind, Worrell W and Reinhart, "Solid Waste Engineering", Cengage Learning India Pvt. Ltd. 2nd Edition, 2016.
2. Tchobanoglous," Integrated Solid Waste Management", Mc-Graw Hill International, 1st Edition, New York, 2014.
3. Charles A. Wentz; "Hazardous Waste Management", McGraw Hill Publication, 1995.
4. CPHEEO, "Manual on Municipal Solid waste management", Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000.
5. A. D. Bhide and B. B. Sundaresan, "Solid Waste Management, Collection, Processing and Disposal",Nagpur. 2001.
6. https://archive.nptel.ac.in/courses/105/103/105103205/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING(Autonomous)
ACCREDITED BY NAAC WITH 'A++' GRADE
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Computer Science & Engineering

BASICS OF JAVA PROGRAMMING
(OPEN ELECTIVE-II)

SYLLABUS FOR B.E. IV-SEMESTER
(COMMON FOR CIVIL, ECE, EEE & MECH)

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code : **U24OE410CS**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 Apply object oriented principles for developing an application using Java constructs.	1 Adopt the fundamentals of Object oriented system development for developing a application.
2 Design GUI using existing Java classes and interfaces.	2 Apply basic features of OOP to design an application. 3 Employ runtime error handling, concurrent programming practices to develop a parallel processing application. 4 Perform string handling, read and write operations using console and files IO streams.

CO-PO and CO-PSO mapping															
CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3	2	3									3		
CO2	2	3	3	3									3		
CO3	2	3	3	3	1								3	1	
CO4	2	3	3	3	1								3	1	
CO5	2	3	2	3									3		

UNIT-I: Object Oriented System Development: Understanding Object Oriented Development, Understanding Object Concepts, Benefits of Object Oriented Development.

Java Programming Fundamentals: Introduction, Overview of Java, Data types, Variables and Arrays, Operators, Control Statements.

UNIT-II: Building blocks of OOP: Classes and Methods, Constructor, Parameterized constructor, Garbage Collection, this, static, final keywords, Inheritance, types of inheritance, Method Overriding, Abstract class, Nested class,

Interface, Package.

UNIT-III: Exception Handling: try, catch, throw, throws, finally, creating user defined exceptions
Multithreaded Programming: Types of Thread creation, multiple threads, isalive, join, thread priority, Thread Synchronization, Inter process communication.

UNIT-IV: String Handling: String constructors, operations, character extraction, comparison, search, modification. StringBuffer, methods, StringBuilder, StringTokenizer
Util: Date, Calendar, Random, Timer, Observable
IO: Files and Directories, I/O Classes and Interfaces, Byte Streams classes and Character Stream classes

Learning Resources:

1. Herbert Schildt, The Complete Reference Java, 7th Edition, Tata McGraw Hill 2005.
2. P. Radha Krishna, Object Oriented Programming through Java, Universities Press, 2007.
3. Sachin Malhotra, Saurabh Choudhary, Programming in Java, 2nd Edition, Oxford Press, 2014.
4. https://docs.oracle.com/javase/tutorial/java

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 1 Hour 30 Minutes

VASAVI COLLEGE OF ENGINEERING(Autonomous)
ACCREDITED BY NAAC WITH 'A++' GRADE
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Computer Science & Engineering

MATHEMATICAL COMPUTING FOR AI & ML WITH PYTHON

Stream- Artificial Intelligence & Machine Learning
(OPEN ELECTIVE-II)
(COMMON for CIVIL, ECE, EEE & MECH)
SYLLABUS FOR B.E IV SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code:**U24OE420CS**
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

Course objective	Course outcomes
Students should be able to	At the end of the course, students will be able to
1. Implementation with Python for mathematical computation to deepen the knowledge.	1. Develop a deep understanding of array usage with Numpy 2. Understanding and Analysing the Pandas Dataframe. 3. Basic concepts of data visualization and its importance in data analysis 4. Solve real life problem using the Linear Regression technique 5. Data representation using Scikit-learn library in Python

CO-PO and CO-PSO mapping

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	2	1	1								2		2
CO2	2	2	2	2	2								2		3
CO3	3	2	3	2	2								2		3
CO4	3	2	2	2	1								2		3
CO5	3	2	2	2	2								2		3

UNIT-I

Numpy Fundamentals: Creating arrays, array indexing, Basic Array Operations, one dimensional and n dimensional array, Creating Matrices using Numpy arrays, Matrix multiplication.

UNIT-II

Introduction to Pandas: **Importing Pandas, Read CSV Files, Analysing Data, Cleaning Data, Pandas Data Structures- Series and Dataframe, Data Correlation.**

UNIT-III

Data Visualization: Introduction to matplotlib, Data exploration with matplotlib- Loading the data, Pie chart, Scatter plot, Box Plot, Bar Chart, 3D plot.

UNIT-IV

Regression: Introduction to Regression, Linear Regression, Multiple Linear Regression, Polynomial Regression, Logistic Regression

UNIT-V

Scikit Learn – **Introduction, Import packages and classes, Dataset Loading, Splitting the Dataset, Train the Model, Simple Linear Regression With scikit-learn, Multiple Linear Regression With scikit-learn.**

Learning Resources:

1. Python Packages By Tomas Beuzen, Tiffany Timbers, 1st edition in 2022 by Chapman & Hall
2. Lambert K.A, Fundamentals of Python –First Programs, 1st Edition(2015), Cengage Learning India
3. Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter, Third Edition by Wes McKinney in 2022 published by Oreilly.
4. Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow 2 by by Sebastian Raschka (Author), Vahid Mirjalili by packt publication on December 2019.
5. https://www.udemy.com/course/machine-learning-basics-building-regression-model-in-python/
6. https://www.geeksforgeeks.org/data-visualization-with-python/

The break-up of CIE : Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	5
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	5

Duration of Internal Test: 1 Hour 30 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF MECHANICAL ENGINEERING

OPERATIONS RESEARCH

(General Pool : Open Elective-II)

SYLLABUS FOR B.E. IV-SEMESTER

Instruction : 3Hrs /week	SEE Marks : 60	Course Code : U24OE420ME
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

Course Objectives	Course Outcomes
The objectives of this course are to: understand the application of mathematics for real time problem solving to LPP, sensitivity analysis under set of constraints, applying mathematical techniques to solve transportation problem and assignment problems, applying time value money and ignoring the same to find the optimal replacement of machines, applying Johnsons rules to find the best sequence to minimize elapsed time and minimum no of servers to minimize waiting time of the customers and optimal utilisation of servers.	On completion of the course, the student will be able to: 1. Apply optimization in multidisciplinary areas through linear programming under different working conditions. 2. Analyze linear programming for a dynamic changes of a customer requirements to suit various Organizations. 3. Reduce total cost to apply for transportation techniques for the transshipment of Goods and products for a product based industry. 4. Estimate the time for replacement of a machine by considering or ignoring time value of money using individual/group replacement policy. 5. Estimate elapsed time for sequencing problem processed through different machines. Minimize waiting time of the customer and optimization of no. of servers.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	3	2	1	2				1	2		2	1	2	1
CO2	1	3	2	1					1	2		2	1	2	1
CO3	1	3	2	2	1				1	2		2	1	2	1
CO4	1	3	2	1					1	2		2	1	2	1
CO5	1	3	2	2	1				1	2		2	1	2	1

UNIT – I

Introduction: Definition and scope of operations research.

Linear programming: Introduction, Formulation of linear programming problems, graphical method of solving LP problem, Simplex method, maximization and minimization, degeneracy in LPP, unbounded and infeasible solutions. Introduction of software to solve LPP.

UNIT – II

Duality: Definition, Relationship between optimal primal and dual solutions. Economic interpretation, Post optimal analysis (restricted to variation of resources i.e., RHS), Dual simplex method.

Transportation model: Finding an initial feasible solution– north west corner method, least cost method, Vogel's approximation method, finding the optimal solution, optimal solution by stepping stone and MODI method, special cases in transportation problems – Unbalanced transportation problem.

UNIT-III

Assignment Problem: Hungarian method of assignment problem, maximization in assignment problem, unbalanced problem, problems with restrictions, travelling salesman problem.

Replacement models: Introduction, Replacement of items that deteriorate ignoring change in money value, replacement of items that deteriorate considering change in money value with time, replacement of items that fail suddenly – individual replacement policy, group replacement policy.

UNIT-IV

Game theory: Introduction, 2 person zero sum games, maximin– minimax principle, principle of dominance, solution for mixed strategy problems graphical method for 2 x n and m x 2 games.

UNIT-V

Sequencing models: Introduction, General assumptions, processing n jobs through 2 machines, processing n jobs through m machines processing 2 jobs through n machines.

Queuing theory: Introduction, Single channel – Poisson arrivals – exponential service times with infinite population and finite population.

Learning Resources:

1. Hamady A. Taha, "Operations Research – An introduction", 6th Edition, PHI Pvt. Ltd., 1997.
2. S.D. Sharma, "Operations Research", Kedarnath, Ramnath & Co., Meerut, 2009.
3. Harvey M. Wagner, "Principles of Operations Research", 2nd Edition, PHI Pvt. Ltd., 1980.
4. V.K. Kapoor, "Operations Research", S. Chand Publishers, New Delhi, 2004.
5. S.S. Rao, "Engineering Optimization – Theory and Practice", 4th Edition, John Wiley & Sons Inc., 2009.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OFMECHANICAL ENGINEERING

Kinematics and Dynamics of Robotics (Open Elective-II)

(Stream: Robotics)

SYLLABUS FOR B.E. IV – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: U24OE410ME
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVE The objective of the course is to	**COURSE OUTCOMES** On completion of the course, students will be able to
To develop the fundamental knowledge and skills required to analyze, design and control robotic systems	1. Analyze the kinematics of robotic systems and apply them to solve real world problems 2 Apply differential kinematics and statics concepts to design and control robotic systems 3 Analyze the dynamics of serial manipulators using lagrangian method. 4 Analyze the dynamics of serial manipulators using lagrangian and Newton-Euler mechanics 5 Generate and analyze robot trajectories for various applications

CO-PO and CO-PSO mapping

CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2			2			2	2		2	3	2	1
CO2	2	2	2			2			2	2		2	3	2	1
CO3	3	3	3			3			3	3		2	3	2	1
CO4	3	2	2		3	3		3	2	2	3	3	3	2	1
CO5	2	2	2		2	2		2	2	2	2	2	3	2	1

UNIT-I

Robot Kinematics

Forward Kinematics: Forward/direct kinematic analysis of serial manipulators.

Inverse Kinematics: General properties of inverse kinematic solution. Inverse kinematics of serial manipulators.

UNIT-II

Differential Kinematics

Linear and angular velocity of links, Manipulator Jacobian for serial manipulators, Jacobian Singularities.

UNIT-III

Static Analysis: Force and moment balance.

Dynamics of serial manipulators

Lagrangian formulation for equations of motion for RP, RR serial manipulators,

Unit-IV

Dynamics of serial manipulators

Recursive dynamics using Newton-Euler formulation of RP and RR serial manipulator.

UNIT-V

Trajectory Generation

Joint-Space Techniques: Cubic Polynomial Trajectories, Linear Segments with Parabolic Blends-without and with via points

Cartesian-Space Techniques: Straight line path, Circular Path, Position Planning, Orientation Planning.

Learning Resources:

1. Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, "Robotics: Modelling, Planning and Control", Springer Science & Business Media, 2010.
2. M.W.Spong and M.Vidyasagar,"Robot Dynamics and Control", 1st Edition, John Wiley and sons,1990.
3. R.K.Mittal and I.J.Nagrath, "Robotics and Control", Tata McGraw-Hill, 2003.
4. Subir Kumar Saha, "Introduction to Robotics", Tata McGraw-Hill Education, 2014.
5. Howie M. Choset, Seth Hutchinson, Kevin M. Lynch, "Principles of Robot Motion: Theory, Algorithms, and Implementation", MIT Press, 2005.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF INFORMATION TECHNOLOGY

OBJECT ORIENTED PROGRAMMING USING JAVA

(GENERAL POOL : OPEN ELECTIVE-II)
(Common for CIVIL, ECE, EEE & MECH)
SYLLABUS FOR B.E. IV SEMESTER

L:T:P (Hrs/week):3:0:0	SEE Marks: 60	Course Code: **U24OE410IT**
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The Objectives of the course:	*On completion of the course, students will be able to*
Explain the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, building simple GUI applications.	1. Understand fundamental concepts in Object oriented approach. 2. Develop object-oriented programs using the concepts of exception handling. 3. Demonstrate the usage of Java I/O streams to handle user input and output. 4. Design and develop GUI programs. 5. Develop applets for web applications.

UNIT- I

Java Programming Fundamentals: Introduction, Overview of Java, Data types, Variables-scope and lifetime, Operators, Control statements, Structure of a Java class, Classes, Methods, Inheritance, and Command Line Arguments.

Arrays: One-dimensional arrays, creating an array, declaration of arrays, initialization of arrays, two-dimensional arrays.

Packages: Creation, importing a package and user defined package.

Interfaces: Defining interfaces, extending interfaces, implementing interfaces.

UNIT- II

Exception Handling: Introduction, types of exceptions, syntax of exception handling code, multiple catch statements, using finally statement, user-defined exceptions.

UNIT- III

Basic I/O Streams: Java I/O classes and interfaces, Files, Stream and Byte classes, Character Streams.

Exploring java.lang: Object, Wrapper classes, String, StringBuffer, System

UNIT- IV

Introducing Awt,Awt Controls:

Event Handling: The Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces.

Control Fundamentals, Labels, Using Buttons, Applying Check Boxes, CheckboxGroup, Choice Controls, Using Lists, Managing Scroll Bars, Using TextField, Using TextArea, Understanding Layout Managers, Menu bars and Menus, Dialog Boxes, FileDialog, Exploring the controls, Menus ,and Layout Managers.

UNIT-V

Applet Programming: Introduction,how applets differ from applications, building applet code,applet life cycle,HTML Applet tag,passing parameters to applets.

Learning Resources:

1. Herbert Schildt, The Complete Reference Java, 7th Edition, Tata McGraw Hill, 2006.
2. James M Slack, Programming and Problem solving with JAVA, Thomson Learning, 2002.
3. C Thomas Wu, An Introduction to Object Oriented Programming with Java 5th edition, McGraw Hill Publishing, 2010.
4. Y. Daniel Liang , An Introduction to JAVA Programming, Tata McGraw Hill, 2009.
5. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2012.
6. https://docs.oracle.com/javase/tutorial/
7. https://nptel.ac.in/courses/106105191/

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERBAD-500031
DEPARTMENT OF INFORMATION TECHNOLOGY

Essentials of Mathematics for Machine learning using Python

(AI&ML Stream : Open Elective-II)
(Common for ECE, EEE, MECH & CIVIL)
SYLLABUS FOR B.E IV-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code: **U24OE420IT**
Credits : 3	CIE Marks : 40	Duration of SEE: 3 Hrs

Course Objectives	**Course Outcomes**
The course will enable the students to:	At the end of the course student will be able to:
Introduce the essential maths principles of linear algebra, vector calculus, probability theory and statistical methods along with exposure to Python libraries for understanding and applying machine learning to real-world problems.	1. Understand the fundamentals of linear algebra – vectors and matrices. 2. Understand and apply various matrix norms, Eigenvectors and PCA techniques. 3. Understand basics of derivatives, integrals and optimization. 4. Understand various data distributions and apply probabilistic techniques to handle uncertainty. 5. Define basic descriptive and inferential statistical measures.

Unit-1 Basics of Linear Algebra

- Scalars, Vectors, Matrices, Tensors for Data Representation and Analysis
- Matrix Analysis (Rank, Determinant, Trace, Orthogonal basis & Inverse)
- Operations: Addition, Subtraction, Scalar Multiplication, Matrix Multiplication, Dot Product, Cross Product Feature Interactions for Data Manipulation
- Python experiments

Unit-2 Matrix

- Matrix Norms: L0 Norm, L1 Norm, L2 Norm; Linear Regression & Regularization
- Eigenvalues and Eigenvectors, Principal Component Analysis
- Python experiments

Unit-3 Vector Calculus

- Derivatives and Gradients
- Differential Operators - Laplacian operator, Gradient operator: for Gradient Descent in Optimization
- Integrals for cumulative distribution function
- Python Experimentation

Unit 4 Probability Theory

- Define Random Variables, Probability Distributions – Gaussian, Bernoulli, Binomial, and Poisson distributions model specific types of events
- Bayes' theorem, uncertainty modelling - updating beliefs based on observed evidence
- Python Experiments

Unit -5 Statistical Methods

- Descriptive Statistics - Expectation, Variance and Covariance
- Central Limit Theorem – Sampling distribution
- Inferential Statistics - Hypothesis Testing – Chi square test, T-Test
- Python Experiments

Learning Resources:

1. Mathematics for Machine Learning, by Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong, Cambridge University Press, 2020.
2. Mathematical Foundation for Machine Learning and AI, https://www.udemy.com/course/mathematical-foundation-for-machine-learning-and-ai/
3. Essential Mathematics for Machine Learning: https://onlinecourses.nptel.ac.in/noc21_ma38/preview

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Tests:		30
2	No. of Assignments:	02	Max. Marks for each Assignment:		05
3	No. of Quizzes:	02	Max. Marks for each Quiz Test:		05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Mathematical Programming for Numerical Computation

Open Elective-II SYLLABUS FOR B.E. IV SEMESTER

L: T: P (Hrs/Week):3:0:0	SEE Marks: 60	Course Code: **U24OE410EE**
Credits:3	CIE Marks: 40	Duration of SEE: 3Hours

COURSE OBJECTIVES The course will enable the students to:	**COURSE OUTCOMES** On completion of the course, students will be able to
To provide fundamental knowledge of programming language for solving problems.	On completion of the course, students will be able to 1. Generate arrays and matrices for numerical problemssolving. 2. Represent data and solution in graphicaldisplay. 3. Write scripts and functions to easily execute series of tasks in problemsolving. 4. Use arrays, matrices and functions in Engineeringapplications 5. Design GUI for basic mathematical applications.

UNIT - I : Introduction:

Basics of MATLAB,MATLAB windows, Advantages of MATLAB,on- line help, file types.

MATLAB Basics: Variables and Constants –Vectors and Matrices- Arrays - manipulation- Built-in MATLAB Functions. Creating and printing simple plots, Creating ,Saving and Executing a Script File, Creating and Executing a function file.

Programming Basics: Data types-Operators – Hierarchy ofoperations, Relational and logical operators, if-end structure, if- else-end structure, if-elseif-else-end structure, switch-case statement, for-end loop, while-end loop, break and continue commands.

UNIT - II : Scripts and Functions

Script Files, Function Files, Debugging methods in MATLAB. **Graphics: Basic 2D plots:** Printing labels- grid and axes box- Entering text in a box- Axis control-Style options-Multiple plots- subplots-specialized 2D plots: stem-,bar, hist, pi, stairs, loglog , semilog ,polar ,comet 3D plots: Mesh,Contour,Surf,Stem3,ezplot.

UNIT - III : Numerical Methods Using MATLAB

Numerical Differentiation, Numerical integration- Newton-Cotes integration

formulae, Multi-step application of Trapezoidal rule, Simpson's 1/3 Rule for Numerical Integration. MATLAB functions for integration.

Linear Equations- Linear algebra in MATLAB, Solving a linear system, Gauss Elimination, Finding eigen values and eigen vectors, Matrix factorizations, Advanced topics.

UNIT - IV : Nonlinear Equations

System of Non-linear equations, Solving System of Equations Using MATLAB function fsolve, Interpolation-Lagrange Interpolation, Two dimensional Interpolation, Straight line fit using Least Square Method, Curve fitting using built-in functions ployval and polyfit ,

cubic fit using least square method. Finding roots of a polynomial - roots function, Newton-Raphson Method.

UNIT - V :

Solution of Ordinary differential Equations(ODEs)-The 4th order Runge-kutta Method, ODE Solvers in MATLAB,Solving First – order equations using ODE23 and ODE45.

Structures and Graphical user interface(GUI): Advanced data Objects, How a GUI works, Creating and displaying a GUI. GUI components, Dialog Boxes.

Learning Resources:

1. Getting started with MATLAB "A quick introduction for scientist and engineers by RudraPratap, Oxfordpublications.
2. Advanced Guide to MATLAB-Practical Examples in Science and Engineering by S.N.Alam, S.Islam, S.K. Patel-I.K. International Publishing House Pvt.Ltd.
3. Stephen J. Chapman-"MATLAB Programming for Engineers"- 5th Edition- Cengage Learning- 2015. Getting started with MATLAB (Version 9) The Mathworks.
4. An Introduction to MATLAB® Programming and Numerical Methods for Engineers 1st Edition by Timmy SiauwAlexandreBayen,Elsevier-18th April2014.
5. https://nptel.ac.in/courses/103106118/2

The break-up of CIE : Internal Tests+ Assignments + Quizzes

1.	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests :90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Accredited by NAAC with A++ Grade
9-5-81, Ibrahimbagh, Hyderbad-500031
DEPARTMENT OF MATHEMATICS

NUMERICAL METHODS
(OPEN ELECTIVE) For B.E., IV - Semester – CBCS
(Common to CSE, CSE-AIML & IT Branches)

Instruction : 3 Hours per week	**Sem. End Exam Marks : 60**	**Subject Reference Code : U24OE410MA**
Credits : 3	**Sessional Marks : 40**	**Duration of Semester End Exam : 3 Hours**

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to :	At the end of the course students should be able to:
1. Study various numerical methods to solve Algebraic and Transcendental equations. 2. Learn the methods to solve linear system of equations. 3. Understand the numerical methods in interpolation and extrapolation. 4. Understand the numerical methods in interpolation using central differences. 5. Understand numerical methods in solving ordinary differential equations.	1. Apply numerical methods to solve Algebraic and Transcendental equations which cannot be solved by traditional algebraic methods 2. Solve linear system of equations using direct and iteration methods. 3. Use various numerical methods in interpolation and extrapolation. 4. Implement various numerical methods in interpolation using central differences. 5. Find numerical solutions of ordinary differential equations.

UNIT – I: (8 Hours)
SOLUTION OF ALGEGBRAIC AND TRANSCENDENTAL EQUATIONS:
Algebraic and Transcendental equations: Bisection method - Newton-Raphson method - Regula-Falsi method.

UNIT – II: (8 Hours)
SOLUTION OF SYSTEM OF LINEAR EQUATIONS:
Direct methods - Gauss elimination method - Factorization method - Iterative methods: Jacobi's method – Gauss-Seidel method - Ill-conditioned system of equations.

UNIT – III: (8 Hours)

NUMERICAL DIFFERENCES - I

Introduction to finite differences - Interpolation- Newton's Forward and Backward Interpolation Formulae - Interpolation with unequal intervals - Lagrange's Interpolation Formula - Divided differences - Newton's divided difference formula.

UNIT – IV: (8 Hours)

NUMERICAL DIFFERENCES - II

Central differences interpolation - Gauss's forwards and backward difference formulae - Stiriling's formula - Bessel's formula.

UNIT – V: (8 Hours)

NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

Numerical Solutions of Ordinary Differential Equations: Taylor's Series Method - Euler's Method - Modified Euler's Method – Runge-Kutta of 4th order (without proofs).

Text Books:

1. Numerical methods in engineering and science by B.S.Grewal, Khanna publishers
2. Advanced Engineering Mathematics by R.K.Jain & S.R.K.Iyengar, Narosa publishing house.

Reference Books:

1. Numerical Analysis by S.S.Sastry, PHI Ltd.

Online Resources:

https://onlinecourses.swayam2.ac.in/cec24_ma19/preview

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

VASAVI COLLEGE OF ENGNEERING (AUTONOMOUS)
DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

INTRODUCTION TO FINTECH

SYLLABUS FOR B.E-IV SEMESTER (Stream based Open Elective)

Instruction: 3 Hrs/week	SEE Marks: 60	Course Code: U24OE450EH
Credits: 3	CIE Marks:40	SEE: 3 hrs.

Course Objectives: This is a theory based paper :	**Course Outcomes:** At the end of the course the students will be able to:
Provides exposure to students regarding financial markets integrating Technology and financial services.	Apply the traditional methods and adopt to the digital methods now used in banks.
Creates awareness about Fintech (focus areas of leading technology companies)	Use digital wallets and digital currency more dexterously.
	Access bank accounts through chatbots in banking sector.

Unit I:
Financial Markets & Services - Capital Markets - Meaning, Features, Structure, instruments - Money markets – characteristics, structure of money market, instruments in money market financial institutions and their importance – Regulators in financial markets of major countries – US, UK and India.

Unit II:
Risk and Return - Concept of Risk – Types of Risks – Measurements of Risk - Risk – Risk Premium – Approaches to risk management – Returns – ExAnte – Ex post returns – Tax effect in Returns – Risk Return Tradeoff.

Unit III:
Overview of Fintech : Concept - Meaning - Evolution of Fintech - Significance - Drivers of fintech - Areas of Fintech - Fintech Opportunities and Challenges - Fintech users - Recent Developments in Fintech.

Unit IV:
Fintech in Banks -Traditional Vs Digital Banks - Neo Banks – Use of technology for banking operations like lending, real time access to bank accounts – Chatbots in Banking – Payment systems concept and importance – Technology adoption in payment systems- Settlement Systems – Concepts – Technology in settlement systems – players in Payments and settlement Systems – Study of RBIs UPI and IMPS – Regtech Ecosystem.

Unit V :

Digital Currencies - Concept of Crypto currency, Working of Crypto currencies - Use of Blokchain and other technologies in Digital currency – Central Bank Digital Currencies – Concept – Use cases - Advantages and Disadvantages of CBDCs – Digital wallets Vs Digital currencies Use cases like AmazonPay, WhatsappPay etc.,

Prescribed Textbook :

Introduction to Fintech, Ist Edition, Pearson publications

Reference Books :

Technology In Specific Financial Process
Cutting-Edge Technology, Pearson publications
Web link: https://amzn.in/d/8PvS87T

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal tests	:	2	Max. Marks	:	30
2	No. of Assignments	:	2	Max. Marks	:	5
3	No. of Quizzes	:	2	Max. Marks	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGNEERING (AUTONOMOUS)
DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

INTRODUCTION TO FINANCE MANAGEMENT FOR ENGINEERS
SYLLABUS FOR B.E - IV SEMESTER
(STREAM BASED ELECTIVE) W.E.F ACADEMIC YEAR 2025-26

Instruction: 3 Hours	SEE: 60	Course code: U24OE410EH
Credits: 3	CIE: 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the learners to: 1. To introduce basic principles of finance and accounting relevant to engineering. 2. To develop the ability to interpret financial statements and assess financial performance. 3. To equip students with tools for cost estimation, budgeting, and financial planning in projects. 4. To familiarize students with concepts of investment analysis and capital budgeting. 5. To enable understanding of economic feasibility and risk analysis in engineering decisions.	At the end of the course the learners will be able to: - 1. Understand and apply basic financial terminology, concepts, and statements. 2. Analyze and interpret balance sheets, income statements, and cash flow reports. 3. Estimate project costs, prepare budgets, and conduct break-even analysis. 4. Evaluate investment options using NPV, IRR, and payback period methods. 5. Assess the financial viability and risks of engineering projects and make informed decisions.

Background:

- This course is for Engineers
- Serves the purpose when these engineers become managers and entrepreneurs
- The focus is on Core Finance
- Prior requirement : Basic Arithmetic and Algebra
- Uniqueness – Introduction to International Finance

Unit -1: Introduction

Why Finance – Difference between finance and accounts – Role of finance in contemporary business – Goals of financial management – Risk Return Trade off – Time Value of Money (Simple numerical problems on PV and FV) - BS, P&L, CF (Only structure) – Components and importance – diff between capex and opex.

Unit -2: Sources of Finance

Sources of fin Information – Company Annual Reports, Government (Budget highlights), Analysts and Regulators (RBI and SEBI only) - Debt Vs Equity – Effect of Leverage – Measurement of Cost of Debt and Equity – WACC – Bond Valuation (Simple Numerical Problems)

Unit-3: Financial performance assessment

Ratio Analysis – Activity, Liquidity and Profitability Ratios - Du Pont Analysis – Budgeting and Variance Analysis – (Simple Numerical problems) – Cash flow from Operations , Financing and Investments (Only theory)

Unit -4: Project Finance

Importance of Project Finance - Project Cost and Means of Finance - Contents of a Project Report – Technical and Environmental Aspects – Commercial and Financial Viability - Projected Financials, NPV, IRR and PIof the project - Sensitivity Analysis

Unit-5: International Finance (Only Theory)

Difference between Domestic and International Finance - Currency exchange Rates regimes- Factors affecting currency exchange rates-Spot and Forward Rates - Currency Forwards, Futures and Swaps - Components of Balance of Payments.

LEARNING RESOURCES:-

Financial Management, I M Pandey, Pearson Ed, ISBN 9789390577255
Financial Management – Theory, Concepts and Problems, R P Rustagi, Taxmann Publications.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal tests	:	2	Max.Marks	:	30
2	No. of assignments	:	3	Max. Marks	:	5
3	No. of Quizzes	:	3	Max. Marks	:	5

Duration of Internal Tests : 90 Minutes

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DEPARTMENT OF MATHEMATICS

NUMERICAL METHODS
(OPEN ELECTIVE)
For B.E., IV - Semester – CBCS
(Common to CSE, CSE-AIML & IT Branches)

Instruction : 3 Hours	SEE Marks : 60	Course Code: **U24OE410MA**
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to :	***At the end of the course students should be able to:***
1. ***Study*** various numerical methods to solve Algebraic and Transcendental equations. 2. ***Learn*** the methods to solve linear system of equations. 3. ***Understand*** the numerical methods in interpolation and extrapolation. 4. ***Understand*** the numerical methods in interpolation using central differences. 5. ***Understand*** numerical methods in solving ordinary differential equations.	1. ***Apply*** numerical methods to solve Algebraic and Transcendental equations which cannot be solved by traditional algebraic methods 2. ***Solve*** linear system of equations using direct and iteration methods. 3. ***Use*** various numerical methods in interpolation and extrapolation. 4. ***Implement*** various numerical methods in interpolation using central differences. 5. ***Find*** numerical solutions of ordinary differential equations.

UNIT – I: (8 Hours)
SOLUTION OF ALGEGBRAIC AND TRANSCENDENTAL EQUATIONS:
Algebraic and Transcendental equations: Bisection method - Newton-Raphson method - Regula-Falsi method.

UNIT – II: (8 Hours)
SOLUTION OF SYSTEM OF LINEAR EQUATIONS:

Direct methods - Gauss elimination method - Factorization method - Iterative methods: Jacobi's method – Gauss-Seidel method - Ill-conditioned system of equations.

UNIT – III: (8 Hours)

NUMERICAL DIFFERENCES - I

Introduction to finite differences - Interpolation- Newton's Forward and Backward Interpolation Formulae - Interpolation with unequal intervals - Lagrange's Interpolation Formula - Divided differences - Newton's divided difference formula.

UNIT – IV: (8 Hours)

NUMERICAL DIFFERENCES - II

Central differences interpolation - Gauss's forwards and backward difference formulae - Stiriling's formula - Bessel's formula.

UNIT – V: (8 Hours)

NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

Numerical Solutions of Ordinary Differential Equations: Taylor's Series Method - Euler's Method - Modified Euler's Method – Runge-Kutta of 4th order (without proofs).

Text Books:

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2. Advanced Engineering Mathematics by R.K.Jain & S.R.K.Iyengar, Narosa publishing house.

Reference Books:

1. Numerical Analysis by S.S.Sastry, PHI Ltd.

Online Resources:

https://onlinecourses.swayam2.ac.in/cec24_ma19/preview

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1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
4	Duration of Internal Tests	:	90 Minutes			

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DEPARTMENT OF MATHEMATICS

ALGEBRAIC STRUCTURES
(OPEN ELECTIVE)
For B.E., IV- Sem.,
(Common to CSE, AIML & IT Branches)

Instruction : 3 Hours	SEE Marks : 60	Course Code: **U24OE420MA**
Credits : 3	CIE Marks: 40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to :	***At the end of the course students should be able to:***
1. ***Study*** the concept of Groups, Finite Groups, Subgroups, Cyclic Groups and their properties. **2.** ***Understand*** Isomorphism – Automorphism of groups and their Properties. **3.** ***Learn*** group Homomorphism and related concepts. **4.** ***Acquire*** knowledge of Rings, Integral domains and Fields, External and Internal direct products. **5.** ***Identify*** Ring Homomorphism, properties and polynomial rings	**1.** ***Solve*** the problems on Groups and will be equipped to apply them in applications like robotics, computer vision, computer graphics and medical image analysis **2.** ***Implement*** the concepts of automorphism in developing encoding and decoding tools of Cryptography **3.** ***Apply*** homomorphism in the study of formal languages, automata theory, and compiler design. **4.** ***Use*** the knowledge of Ring, Integral domain and Field in coding theory. **5.** ***Compute*** the programming of modern computer algebra algorithms using ring homomorphism.

UNIT – I: (8 Hours)
GROUPS
Binary operations - Groups – Definition, Elementary properties of Groups, Finite Groups, Subgroups, Cyclic Groups – Properties of Cyclic Groups, Fundamental theorem of Cyclic Groups-Classification of Subgroups of Cyclic Group.

UNIT – II: (8 Hours)
GROUP ISOMORPHISM
Isomorphism – Definition, Properties (without proof)- Automorphism - Cosets - Properties of Cosets (without proof), Lagrange's theorem.

UNIT – III: (8 Hours)

GROUP HOMOMORPHISM

External Direct Product - Definition, Properties(without proof), Normal Subgroups and Factor Groups, Internal Direct Product, Group Homomorphism – Definition, Properties (without proof).

UNIT – IV: (8 Hours)

RINGS

Rings, Properties of Rings (without proof) – Subrings - Integral Domains and Fields - Ideals- Prime and Maximal Ideals.

UNIT – V: (8 Hours)

RING HOMOMORPHISM

Ring Homomorphism - Properties of Ring Homomorphism (without proof) - Polynomial Rings - The Division Algorithm.

Text Books:

Contemporary Abstract Algebra, Joseph A. Gallian, CRC Press

Reference Books:

1. Topics in Algebra, I. N. Herstein, John Wiley & Sons
2. Basic Abstract Algebra, P. B. Bhattacharya, S. K. Jain, S. R. Nagpaul, Cambridge University Press
3. Abstract Algebra, D. S. Dummit, R. M. Foote, John Wiley & Sons, Inc.
4. A First Course in Abstract Algebra, John B. Fraleigh, Pearson Education Limited

Online Resources :

1. **https://ocw.mit.edu/courses/18-703-modern-algebra-spring-2013/**
2. https://onlinecourses.nptel.ac.in/noc19_cs78/preview

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
4	Duration of Internal Tests	:	90 Minutes			

SCHEME OF INSTRUCTION AND EXAMINATION(R-24)
FOR B.E BRIDGE COURSE IV SEMESTER (A.Y 2025-26)
Common for CSE, CSE (AI&ML) and IT

SEMESTER - IV (BRIDGE COURSE)									
S No.	Course Code	Course Name	Scheme of Instruction			Duration in Hrs	Scheme of Examination		Credits
			Hours per week				Maximum Marks		
			L	T	P/D		SEE	CIE	
THEORY									
1	UB24HS410EH	English Language Communication	2	-	-	3	50	-	-
PRACTICAL									
1	UB24HS411EH	English Language Communication Skills Lab	-	-	2	3	50	-	-
		Total	**2**	**-**	**2**	**-**	**100**	**-**	**-**
		Grand Total	**4**			**-**	**100**		

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD-31
DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

ENGLISH LANGUAGE AND COMMUNICATION (Theory)

Bridge Course for Lateral Entry Students

IV Semester

L:T:P(Hrs/Week): 2:0:0	SEE Marks: 50	Course Code: **UB24HS410EH**
Credits: Nil	CIE Marks: Nil	Duration of SEE: 2 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The Course will enable the Learners to:	**At the end of the course the students will be able to :**
1. Converse effectively in various context.	1. Use language in appropriate contexts.
2. Listen for general and specific comprehension and write paragraphs.	2. Listen for global comprehension and infer meaning from spoken discourses.
3. Understand the elements of a good paragraph	3. Write paragraphs coherently.
4. Speak appropriately in daily conversations	4. Use phrases, essential vocabulary and polite expressions in every day conversations.

Unit-1 1.0: Communication & Functional English

1.1 Role and Importance of Communication, Process of Communication, Non-verbal communication, barriers to Communication, overcoming barriers. Conversational phrases: greetings, introductions, apology, compliments, agreeing and disagreeing, polite forms in everyday conversations.

Unit 2 2.0: Listening

2.1 Importance of listening, Active listening

Unit 3. 3.0: Writing

1.1 Paragraph writing, coherence and cohesion.

Unit 4 4.0: Grammar and Vocabulary

4.1 Common Errors, one word substitutes, collocations.

Unit-5 5.0: Reading

5.1 **Prose text-** Our Own Civilization—CEM Joad.

Prescribed textbook for theory:

- Technical communication - Principles and Practice (2nd Edition 2014) - Meenakshi Raman and Sangeeta Sharma- Oxford University Press.

Suggested Reading

- E.Suresh kumar, P. Sreehari and J. Savithri - Essential English
- Reading comprehension - Nuttal.J.C - Orient Blackswan
- Sunitha Mishra,C. Murali Krishna, Communication Skills for Engineers, Pearson, 2004.
- M. Ashraf Rizvi. Effective Technical Communication. Tata Mcgraw Hill, 2005.
- Allen and Waters., How English Works.
- Willis Jane., English through English.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD-31
DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB (ELCS)

Bridge Course for Lateral Entry Students

(Common to all branches)

IV Semester

L:T:P(Hrs/Week): 0:0:2	SEE Marks: 50	Course Code: **UB24HS411EH**
Credits: Nil	CIE Marks: Nil	Duration of SEE: 2 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The Course will enable the learners to:	**At the end of the course the learners will be able to :**
The Course will enable the learners to: 1. Converse in various situations. 2. Make paper and PowerPoint presentations. 3. Speak effectively using discourse markers.	**At the end of the course the learners will be able to :** 1. Participate effectively in group discussions, public speaking. Listen for gist and make inferences from various speeches. 2. Research and sift information to make presentations. 3. Use connectives and make transitions effectively while speaking.

INTERACTIVE COMMUNICATION SKILLS LAB

Public speaking: Do's and Dont's of public speaking, Listening to speeches of great personalities in history to understand the nuances of public speaking.

Presentation Skills: Making effective presentations, research on various topics, use of Audio visual aids, coping with nerves.

Group discussion: Objectives of GD, Types of GDs; Initiating, Continuing, and concluding a GD.

Prescribed text book for laboratory:

Speak Well: Jayshree Mohanraj, Kandula Nirupa Rani and Indira Babbellapati- Orient Black Swan.

Learning Resources:

1. Bala Subramanian : A textbook of English phonetics for Indian students, Macmillan, 2008.
2. Priyadarshini Patnaik: Group discussion and interviews, Cambridge University Press India private limited 2011.
3. Daniel Jones: Cambridge English Pronouncing Dictionary – A Definitive guide to contemporary English Pronunciation.

SEE	:	50 marks
Duration	:	180minutes