



# **TAKSHASHILA UNIVERSITY**

**(Tamil Nadu State Private University)**

**ONGUR, TINDIVANAM TK, VILLUPURAM DT**

## **FACULTY OF ENGINEERING AND TECHNOLOGY SCHOOL OF COMPUTATIONAL ENGINEERING**

**Department of Computer Science and Engineering**

### **REGULATION 2025NEP CURRICULUM & SYLLABI**

**B.Tech - CSE**

**Semester – III**



## VISION AND MISSION OF UNIVERSITY

### VISION:

To create change makers and world leaders similar to the ancient Takshashila University

### MISSION:

The brightest minds and the best resources are used to nurture and develop the leaders of tomorrow, where they are encouraged to be eternally curious and ethically sound.

## DEPARTMENT VISION AND MISSION

### VISION:

To be a center of excellence in Computer Science and Engineering through quality education, innovation, and research, producing ethical professionals to meet global and societal needs

### MISSION:

|                                             |                                                                                                 |
|---------------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>M1: Quality Education</b>                | Deliver quality education through outcome-based learning and modern teaching practices.         |
| <b>M2: Innovation and Research</b>          | Foster innovation, research, and industry collaboration to solve real-world problems.           |
| <b>M3: Career Development</b>               | Enhance employability and entrepreneurship through skill development and experiential learning. |
| <b>M4: Ethics and Social Responsibility</b> | Promote professionalism, ethical values, leadership, and lifelong learning.                     |

## PROGRAMME OUTCOMES (POs)

### **PO1: Engineering knowledge**

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

### **PO2: Problem analysis**

Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

### **PO3: 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.

### **PO4: 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.

### **PO5: Modern tool usage**

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

### **PO6: 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.

### **PO7: 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.

### **PO8: Ethics**

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

### **PO9: Individual and team work**

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

### **PO10: 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.

### **PO11: 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.

### **PO12: 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.

## **PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

### **PEO1: Career Excellence**

Build successful careers in industry, academia, research, or entrepreneurship.

### **PEO2: Innovation**

Develop innovative and sustainable computing solutions.

### **PEO3: Professionalism**

Demonstrate ethics, leadership, teamwork, and effective communication.

### **PEO4: Lifelong Learning**

Adapt to emerging technologies through continuous learning.

## **PROGRAM SPECIFIC OUTCOMES (PSOs)**

### **PSO1: Software Development**

Design and develop efficient software solutions using modern computing techniques.

### **PSO2: Emerging Technologies**

Apply emerging computing technologies and modern tools to develop intelligent and scalable solutions for real-world problems.

### **PSO3: Professional Practice**

Demonstrate innovation, technical competence, ethical responsibility, and effective communication.



**Faculty of Engineering and Technology**  
**B.Tech. in Computer Science and Engineering**

**(REGULATION 2025NEP)**  
**SEMESTER – III**

| Sl. No.                | Course Code | Course Title                            | Category | Periods |   |   | Credits   | Hrs.       | Max. Marks      |        |     |     |     |    |            |            |            |
|------------------------|-------------|-----------------------------------------|----------|---------|---|---|-----------|------------|-----------------|--------|-----|-----|-----|----|------------|------------|------------|
|                        |             |                                         |          | L       | T | P |           |            | CAT Best of Two | Assign | MCQ | ATT | SEM | P  | CAM        | ESM        | Total      |
| 1                      | U25MA06T    | Probability and Statistics              | BS       | 3       | 1 | 0 | 4         | 60         | 20              | 5      | 5   | 5   | 5   | -  | 40         | 60         | 100        |
| 2                      | U25EC08B    | Digital Principle and System Design     | ES       | 3       | 0 | 2 | 4         | 75         | 20              | 5      | 5   | 5   | 5   | 10 | 50         | 50         | 100        |
| 3                      | U25CE04B    | Data Structures                         | PC       | 3       | 0 | 2 | 4         | 75         | 20              | 5      | 5   | 5   | 5   | 10 | 50         | 50         | 100        |
| 4                      | U25ML02T    | Fundamentals of Artificial Intelligence | PC       | 3       | 0 | 0 | 3         | 45         | 20              | 5      | 5   | 5   | 5   | -  | 40         | 60         | 100        |
| 5                      | U25CE05B    | Java Programming                        | PC       | 3       | 0 | 2 | 4         | 75         | 20              | 5      | 5   | 5   | 5   | 10 | 50         | 50         | 100        |
| 6                      | U25BA10T    | Total Quality Management                | HS       | 2       | 0 | 0 | 2         | 30         | 20              | 5      | 5   | 5   | 5   | -  | 40         | 60         | 100        |
| <b>Total:</b>          |             |                                         |          |         |   |   | <b>21</b> | <b>360</b> |                 |        |     |     |     |    | <b>270</b> | <b>330</b> | <b>600</b> |
| 7                      | U25VA06T    | Constitution of India                   | VAC      | 1       | 0 | 0 | 0         | 15         | -               | 40     | 40  | 5   | 15  | -  | 100        | -          | 100        |
| 8                      | U25SE02P    | Skill Enhancement Course - II           | SEC      | 0       | 0 | 1 | 0         | 15         | -               | -      | -   | -   | -   | -  | 100        | -          | 100        |
| 9                      | U25AE01P    | Ability Enhancement Course - I          | AEC      | 0       | 0 | 1 | 0         | 15         | -               | -      | -   | -   | -   | -  | 100        | -          | 100        |
| <b>Total:</b>          |             |                                         |          |         |   |   | <b>0</b>  | <b>45</b>  |                 |        |     |     |     |    | <b>300</b> |            | <b>300</b> |
| <b>Semester Total:</b> |             |                                         |          |         |   |   | <b>21</b> | <b>405</b> |                 |        |     |     |     |    | <b>570</b> | <b>330</b> | <b>900</b> |

**Note:**

**L** - Lecture

**ATT** - Attendance

**CAT** - Continuous Assessment Test

**ESM** – End Semester Exam Marks

**ASS** - Assignment

**P** - Practical

**SEM**- Seminar

**T** - Tutorial

**CAM** - Continuous Assessment Marks

**PW** - Project

**BoS Chairman**

| U25MA06T | Probability and Statistics | L | T | P | C | Total |
|----------|----------------------------|---|---|---|---|-------|
|          |                            | 3 | 1 | 0 | 4 | 60    |

### COURSE OBJECTIVES:

|                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>To develop an understanding of the fundamentals of effective communication</li> </ul>                                  |
| <ul style="list-style-type: none"> <li>To enhance listening and reading skills using appropriate comprehension strategies</li> </ul>                          |
| <ul style="list-style-type: none"> <li>To improve speaking skills for effective interpersonal and professional communication</li> </ul>                       |
| <ul style="list-style-type: none"> <li>To develop students' reading strategies, comprehension skills, and ability to summarize or paraphrase texts</li> </ul> |
| <ul style="list-style-type: none"> <li>To develop writing skills for academic, professional, and workplace communication</li> </ul>                           |

### COURSE OUTCOMES:

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

|              |                                                                                                                                                                 |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1 :</b> | Evaluate randomness in certain realistic situation which can be either discrete or continuous type and compute statistical constants of these random variables. |
| <b>CO2 :</b> | Provide very good insight which is essential for industrial applications by learning probability distributions.                                                 |
| <b>CO3 :</b> | Higher up thinking skills to make objective, data-driven decisions by using correlation and regression.                                                         |
| <b>CO4 :</b> | Assess the importance of sampling distribution of a given statistic of a random sample.                                                                         |
| <b>CO5 :</b> | Analyze and interpret statistical inference using samples of a given size which is taken from a population.                                                     |

|                                                                                                                                                                                                     |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>UNIT I: Probability Concepts and Random Variable</b>                                                                                                                                             | <b>12 Hrs.</b> |
| Probability Space – Events - Axiomatic approach to Probability - Conditional Probability - Independent Events - Baye's Theorem - Single Random Variables - Discrete and Continuous Random Variable. |                |

|                                                                                                                                      |                |
|--------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>UNIT II: Probability Distribution</b>                                                                                             | <b>12 Hrs.</b> |
| Discrete Distributions: Binomial, Poisson and Geometric - Continuous Distributions: Uniform, Exponential and Normal (Problems Only). |                |

|                                                                                                                                                                                                                                                                          |                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>UNIT III: Correlation and Regression</b>                                                                                                                                                                                                                              | <b>12 Hrs.</b> |
| Correlation - Coefficient of correlation - Karl Pearson's Coefficient of Correlation - Rank correlation – Spearman's Rank Correlation - Regression - Linear Regression coefficients Lines of Regression – Regression equation of Y on X - Regression equation of X on Y. |                |

|                                                                                                                                                                                                                                                                                                                    |                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>UNIT IV: Testing of Hypothesis for Large Samples</b>                                                                                                                                                                                                                                                            | <b>12 Hrs.</b> |
| Null and Alternative hypothesis - Type I and Type II errors - Critical region - Confidence interval - Level of significance - One tailed and Two Tailed Test - Large Sample Tests: Test of significance - Large sample test for single mean - difference of means - single proportion - difference of proportions. |                |

|                                                                                                                                                                                          |                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>UNIT V: Testing of Hypothesis for Small Samples</b>                                                                                                                                   | <b>12 Hrs.</b> |
| Small samples: Test for single mean - difference of means - paired t-test - test for ratio of variances (F-test) - Chi - square test for goodness of fit and independence of attributes. |                |

**Total Hours: 60**

|                     |                                                                                                                                                     |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TEXT BOOKS :</b> |                                                                                                                                                     |
| 1.                  | S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics," Sultan Chand & Sons Private Limited, 12 <sup>th</sup> Edition, 2020.       |
| 2.                  | T. Veerarajan, "Probability, Statistics and Random Processes with Queuing Theory and Queuing Networks", McGraw Hill, 4 <sup>th</sup> Edition, 2024. |

|                          |                                                                                                                                                                      |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>REFERENCE BOOKS :</b> |                                                                                                                                                                      |
| 1.                       | Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists," Academic Press Inc; 5th edition, 2014.                                   |
| 2.                       | Jay L. Devore, Probability and Statistics for Engineering and the Sciences, 10th Edition, Cengage Learning, 2024.                                                    |
| 3.                       | P. Mohana Shankar, Probability, Random Variables, and Data Analytics with Engineering Applications, Springer Nature, 2021.                                           |
| 4.                       | Dennis D. Wackerly, William Mendenhall III, and Richard L. Scheaffer, Mathematical Statistics with Applications, 8th Edition, Cengage Learning, 2023.                |
| 5.                       | Walpole. R. E., Myers. R. H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers Scientists," Pearson Education, Asia, 9 <sup>th</sup> Edition, 2024. |

**WEB REFERENCES :**

|    |                                                                                                                                                               |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <a href="https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_ma43">https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_ma43</a>                 |
| 2. | <a href="https://online.stat.psu.edu/stat500/">https://online.stat.psu.edu/stat500/</a>                                                                       |
| 3. | <a href="https://projects.iq.harvard.edu/stat110">https://projects.iq.harvard.edu/stat110</a>                                                                 |
| 4. | <a href="https://www.cpp.edu/videotutorials/ime/probability-and-statistics.shtml">https://www.cpp.edu/videotutorials/ime/probability-and-statistics.shtml</a> |
| 5. | <a href="https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_mg31">https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_mg31</a>                 |

**COs/POs/PSOs Mapping :**

| COs | Program Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    | Program Specific Outcomes (PSOs) |   |   |
|-----|------------------------|---|---|---|---|---|---|---|---|----|----|----|----------------------------------|---|---|
|     | 1                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1                                | 2 | 3 |
| 1   | 3                      | 3 | 1 | 2 | 2 | - | - | - | - | -  | -  | 1  | 2                                | 2 | 1 |
| 2   | 3                      | 3 | 2 | 2 | 2 | - | - | - | - | -  | -  | 1  | 2                                | 3 | 1 |
| 3   | 3                      | 3 | 2 | 3 | 3 | - | - | - | - | -  | -  | 1  | 3                                | 3 | 2 |
| 4   | 3                      | 3 | 2 | 3 | 3 | - | - | 1 | - | -  | -  | 2  | 2                                | 2 | 1 |
| 5   | 3                      | 3 | 2 | 3 | 3 | - | - | 1 | - | -  | 1  | 2  | 3                                | 3 | 2 |

Correlation Level: 1-Low, 2-Medium, 3- High, '-' - no correlation



**BoS Chairman**

|          |                                      |   |   |   |   |       |
|----------|--------------------------------------|---|---|---|---|-------|
| U25EC08B | Digital Principles and System Design | L | T | P | C | Total |
|          |                                      | 3 | 0 | 2 | 4 | 75    |

### COURSE OBJECTIVES:

|                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>To understand the fundamentals of number systems, Boolean algebra and logic gate implementations</li> </ul>             |
| <ul style="list-style-type: none"> <li>To design and analyze combinational digital circuits using arithmetic and logic building blocks</li> </ul>              |
| <ul style="list-style-type: none"> <li>To analyze synchronous sequential circuits using flip flops, counters and finite state machines</li> </ul>              |
| <ul style="list-style-type: none"> <li>To study the behaviour and design issues of asynchronous sequential circuits and hazard free systems</li> </ul>         |
| <ul style="list-style-type: none"> <li>To understand memory organization, programmable logic devices and FPGA architectures used in digital systems</li> </ul> |

### COURSE OUTCOMES:

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

|       |                                                                                                          |
|-------|----------------------------------------------------------------------------------------------------------|
| CO1 : | Apply number systems, Boolean algebra and simplification techniques for digital logic design.            |
| CO2 : | Design and analyze combinational circuits using adders, multiplexers, decoders and related components.   |
| CO3 : | Analyze and design synchronous sequential circuits using flip flops, counters and finite state machines. |
| CO4 : | Examine asynchronous sequential circuits and design hazard free digital systems.                         |
| CO5 : | Explain memory devices, FPGA architecture and programmable logic devices used in digital systems.        |

|                                                                                                                                                                                                                                                                                                                                                                                     |               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT I: Basic Digital Systems</b>                                                                                                                                                                                                                                                                                                                                                | <b>9 Hrs.</b> |
| Number systems – Binary, Decimal, Octal, Hexadecimal conversions- Boolean algebra and theorems – Signed number representations–Sum of Product and Product of sum simplification-Canonical forms min term and max term – Simplification of Boolean Expression- Karnaugh maps and Quine McCuskey method – Implementation of Boolean expression using Logic gates and Universal gates. |               |

|                                                                                                                                                                                                                                                                                          |               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT II: Combinational Circuit Design</b>                                                                                                                                                                                                                                             | <b>9 Hrs.</b> |
| Design of combinational circuits – Half adder and full adder – Subtractor – Parallel adder – Carry look ahead adder – BCD adder - Multiplexer and Demultiplexer – Encoder and Decoder – Magnitude comparator – Code converters – Parity Generator/Checker-Seven Segment display decoder. |               |
| <b>UNIT III: Synchronous Sequential Circuits</b>                                                                                                                                                                                                                                         | <b>9 Hrs.</b> |
| Latches and Flip flops – SR, JK, D and T flip flops –Shift registers – Ripple counters – Ring Counters - Synchronous counters – Asynchronous counters — Analysis and design of Finite State Machine – Moore and Mealy models - State reduction and assignment.                           |               |
| <b>UNIT IV: Asynchronous Sequential Circuits</b>                                                                                                                                                                                                                                         | <b>9 Hrs.</b> |
| Stable and Unstable States-Cycles and races-state reduction-race free assignments – Hazards-Essential Hazards-Fundamental and pulse mode sequential circuits - Design of Hazard free Circuits.                                                                                           |               |
| <b>UNIT V: Memory And Programmable Logic Devices</b>                                                                                                                                                                                                                                     | <b>9 Hrs.</b> |
| Memory organization – RAM, ROM, PROM, EPROM, EEPROM and Flash memory – FPGA architecture –Programmable Logic arrays(PLA) and Programmable Array Logic (PAL).                                                                                                                             |               |

**Total Hours: 45**

### List of Experiments

1. Verification of basic logic gates and universal gates using truth tables.
2. Design and implementation of Half Adder and Full Adder circuits using logic gates.
3. Design and implementation of Half Subtractor and Full Subtractor circuits using logic gates.
4. Design and implementation of Binary to Gray Code and Gray to Binary Code converters.
5. Design and implementation of BCD to Excess-3 Code and Excess-3 to BCD Code converters.
6. Design and implementation of Binary to ASCII and ASCII to Binary Code converters.
7. Implementation and verification of Multiplexer and Demultiplexer circuits.
8. Design and implementation of Encoder and Decoder circuits.
9. Design and implementation of SR, JK, D and T Flip Flops using logic gates.
10. Design and implementation of Shift Registers and Ring Counters.

**Total Hours: 30**

|                    |                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------|
| <b>TEXT BOOKS:</b> |                                                                                                |
| 1.                 | M. Morris Mano and Michael D. Ciletti, “Digital Design”, 6th Edition, Pearson Education, 2024. |

|    |                                                                                                                                        |
|----|----------------------------------------------------------------------------------------------------------------------------------------|
| 2. | Charles H. Roth Jr., Larry L. Kinney and Eugene B. John, “Fundamentals of Logic Design”, Enhanced 7th Edition, Cengage Learning, 2021. |
|----|----------------------------------------------------------------------------------------------------------------------------------------|

#### REFERENCE BOOKS:

|    |                                                                                                                                   |
|----|-----------------------------------------------------------------------------------------------------------------------------------|
| 1. | Donald D. Givone, “Digital Principles and Design”, Tata McGraw Hill Education, Reprint Edition, 2017.                             |
| 2. | Thomas L. Floyd and R. P. Jain, “Digital Fundamentals”, 11th Edition, Pearson Education, 2015.                                    |
| 3. | John F. Wakerly, “Digital Design: Principles and Practices”, 5th Edition, Pearson Education, 2018.                                |
| 4. | Stephen Brown and Zvonko Vranesic, “Fundamentals of Digital Logic with Verilog Design”, 4th Edition, McGraw Hill Education, 2014. |

#### WEB REFERENCES:

|    |                                                                                                                                                                                       |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <a href="https://nptel.ac.in/courses/108106165">https://nptel.ac.in/courses/108106165</a>                                                                                             |
| 2. | <a href="https://ocw.mit.edu/courses/6-111-introductory-digital-systems-laboratory-fall-2006">https://ocw.mit.edu/courses/6-111-introductory-digital-systems-laboratory-fall-2006</a> |
| 3. | <a href="https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials">https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials</a>                       |
| 4. | <a href="https://www.tutorialspoint.com/digital_circuits/index.htm">https://www.tutorialspoint.com/digital_circuits/index.htm</a>                                                     |

#### COs/POs/PSOs Mapping :

| Cos | Program Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    | Program Specific Outcomes (PSOs) |   |   |
|-----|------------------------|---|---|---|---|---|---|---|---|----|----|----|----------------------------------|---|---|
|     | 1                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1                                | 2 | 3 |
| 1   | 3                      | 3 | 2 | - | - | 2 | 1 | - | - | -  | -  | -  | 3                                | 2 | 1 |
| 2   | 3                      | 3 | 3 | - | 2 | 2 | 1 | - | - | -  | -  | -  | 3                                | 2 | 1 |
| 3   | 3                      | 2 | 3 | - | 2 | 2 | 1 | - | - | -  | -  | -  | 3                                | 3 | 1 |
| 4   | 3                      | 2 | 2 | - | 1 | 2 | 1 | - | - | -  | -  | -  | 3                                | 3 | 1 |
| 5   | 2                      | 2 | 3 | - | 2 | 2 | 1 | - | - | 1  | -  | -  | 3                                | 3 | 2 |

Correlation Level: 1-Low, 2-Medium, 3- High, '-' - no correlation



**BoS Chairman**

|          |                 |   |   |   |   |       |
|----------|-----------------|---|---|---|---|-------|
| U25CE04B | Data Structures | L | T | P | C | Total |
|          |                 | 3 | 0 | 2 | 4 | 75    |

### COURSE OBJECTIVES:

|                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>To impart the basic concepts of data structures and its terminologies</li> </ul>     |
| <ul style="list-style-type: none"> <li>To understand concepts about stack and queue operations</li> </ul>                   |
| <ul style="list-style-type: none"> <li>To understand basic concepts about linked list and its various operations</li> </ul> |
| <ul style="list-style-type: none"> <li>To understand concepts about Tree and its applications</li> </ul>                    |
| <ul style="list-style-type: none"> <li>To understand basic concepts about Sorting, Hashing and Graph</li> </ul>             |

### COURSE OUTCOMES:

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

|      |                                                                                     |
|------|-------------------------------------------------------------------------------------|
| CO1: | Compute time and space complexity for given problems                                |
| CO2: | Demonstrate the implementation and applications of stack and queue data structures. |
| CO3: | Illustrate the various operations of linked list.                                   |
| CO4: | Analyze and apply different tree data structures.                                   |
| CO5: | Compare and apply appropriate sorting, hashing, and graph traversal techniques.     |

|                                                                                                                                                                                                                                                                                                              |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT I: Basic Terminologies of Data Structures</b>                                                                                                                                                                                                                                                        | <b>9 Hrs.</b> |
| Introduction: Basic Terminologies – Elementary Data Organizations. Data Structure Operations: Insertion – Deletion – Traversal. Analysis of an Algorithm. Asymptotic Notations. Time-Space trade off. Array and its operations. Searching: Linear Search and Binary Search Techniques – Complexity analysis. |               |

|                                                                                                                                                                                                                       |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT II: Stack And Queue Operations</b>                                                                                                                                                                            | <b>9 Hrs.</b> |
| Stack and Queues: ADT Stack and its operations. Applications of Stacks: Expression Conversion and evaluation. ADT Queue and its operations. Types of Queue: Simple Queue – Circular Queue – Priority Queue – Dequeue. |               |

|                                                                                                                                                                                                                                                           |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT III: Linked List Operations</b>                                                                                                                                                                                                                   | <b>9 Hrs.</b> |
| Linked lists: Singly linked list: Representation in memory. Algorithms of several operations: Traversing – Searching – Insertion – Deletion. Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations. |               |

|                                                                                                                                                                                             |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT IV: Trees</b>                                                                                                                                                                       | <b>9 Hrs.</b> |
| Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree – Threaded Binary Tree – Binary Search Tree – Binary Tree Traversals – AVL Tree. Introduction to B-Tree and B+ Tree. |               |

|                                                                                                                                                                                                                                                                                                 |               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT V: Sorting, Hashing And Graphs</b>                                                                                                                                                                                                                                                      | <b>9 Hrs.</b> |
| Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort and Radix Sort. Performance and Comparison among the sorting methods. Hashing: Hash Table – Hash Function and its characteristics. Graph: Basic Terminologies and Representations – Graph traversal algorithms. |               |

**Total Hours: 45**

### List of Exercises

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
3. Write a C program to implement list ADT to perform following operations a) Insert an element into a list. a) Delete an element from list c) Search for a key element in list d) count number of nodes in list.
4. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.
5. Write a C program to implement the dequeue (double ended queue) ADT using a doubly linked list and an array.
6. Write a C program to perform the following operations:
  - Insert an element into a binary search tree.
  - Delete an element from a binary search tree.
  - Search for a key element in a binary search tree.
7. Write a C program that use recursive functions to traverse the given binary tree in
  - a) Preorder b) Inorder and c) Postorder.

8. Write a C program to perform the AVL tree operations.
9. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
10. Write a C program to implement Graph Traversal Techniques.

**Total Hours: 30**

**TEXT BOOKS :**

|    |                                                                                                                                        |
|----|----------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Reema Thareja, Data Structures Using C, 3rd Edition, Oxford University Press, 2024.                                                    |
| 2. | Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, 4th Edition, MIT Press, 2022. |

**REFERENCE BOOKS :**

|    |                                                                                                                                                       |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Narasimha Karumanchi, Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles, 6th Edition, Career Monk Publications, 2024. |
| 2. | Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 2023.                                                  |
| 3. | Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, 2nd Edition, Universities Press, Reprint 2023.           |
| 4. | Seymour Lipschutz and Vijayalakshmi Pai G., Schaum's Outline of Data Structures with C, 2nd Edition, McGraw-Hill Education, 2022.                     |

**WEB REFERENCES:**

|    |                                                                                                                                                                                                   |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <a href="https://nptel.ac.in/courses/106106130">https://nptel.ac.in/courses/106106130</a>                                                                                                         |
| 2. | <a href="https://www.geeksforgeeks.org/dsa/dsa-tutorial-learn-data-structures-and-algorithms/">https://www.geeksforgeeks.org/dsa/dsa-tutorial-learn-data-structures-and-algorithms/</a>           |
| 3. | <a href="https://cp-algorithms.com/">https://cp-algorithms.com/</a>                                                                                                                               |
| 4. | <a href="https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-fall-2011/">https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-fall-2011/</a>                                     |
| 5. | <a href="https://docs.google.com/presentation/d/1jjivjdvdD4mx6qb4bd4rUKB6FDZbYtveJ5NKeyVeA1lk/edit">https://docs.google.com/presentation/d/1jjivjdvdD4mx6qb4bd4rUKB6FDZbYtveJ5NKeyVeA1lk/edit</a> |

| COs/POs/PSOs Mapping: |                        |   |   |   |   |   |   |   |   |    |    |    |                                  |   |   |
|-----------------------|------------------------|---|---|---|---|---|---|---|---|----|----|----|----------------------------------|---|---|
| COs                   | Program Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    | Program Specific Outcomes (PSOs) |   |   |
|                       | 1                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1                                | 2 | 3 |
| 1                     | 3                      | 3 | 1 | 2 | 1 | - | - | - | - | -  | 3  | -  | 2                                | 2 | 1 |
| 2                     | 3                      | 2 | 3 | 2 | 3 | - | - | 1 | 1 | -  | 2  | -  | 3                                | 2 | 1 |
| 3                     | 3                      | 3 | 3 | 2 | 2 | - | - | 1 | 1 | -  | 2  | -  | 3                                | 2 | 1 |
| 4                     | 3                      | 3 | 3 | 3 | 2 | - | - | 1 | 1 | -  | 2  | -  | 3                                | 3 | 1 |
| 5                     | 3                      | 3 | 3 | 2 | 3 | - | - | 1 | 1 | 1  | 3  | -  | 3                                | 3 | 2 |

Correlation Level: 1-Low, 2-Medium, 3- High, '-' - no correlation



**BoS Chairman**

|          |                                         |   |   |   |   |       |
|----------|-----------------------------------------|---|---|---|---|-------|
| U25ML02T | Fundamentals of Artificial Intelligence | L | T | P | C | Total |
|          |                                         | 3 | 0 | 0 | 3 | 45    |

### COURSE OBJECTIVES:

|                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>To understand the basic concepts and principles of Artificial Intelligence.</li> </ul>                                                                             |
| <ul style="list-style-type: none"> <li>To learn AI problem-solving methods and search techniques.</li> </ul>                                                                                              |
| <ul style="list-style-type: none"> <li>To understand knowledge representation and reasoning in AI.</li> </ul>                                                                                             |
| <ul style="list-style-type: none"> <li>To study planning, intelligent agents, and machine learning techniques.</li> </ul>                                                                                 |
| <ul style="list-style-type: none"> <li>To explore the applications of Artificial Intelligence in language processing, information retrieval, speech recognition, and other real-world domains.</li> </ul> |

### COURSE OUTCOMES:

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

|       |                                                                                                                                                      |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 : | Formulate problems and develop intelligent agents.                                                                                                   |
| CO2 : | Apply search algorithms to solve AI problems.                                                                                                        |
| CO3 : | Understand knowledge representation and reasoning techniques.                                                                                        |
| CO4 : | Explain AI planning and basic machine learning methods.                                                                                              |
| CO5 : | Describe the applications of Artificial Intelligence in language models, natural language processing, speech recognition, and information retrieval. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT I : Introduction To AI And Agents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>9 Hrs.</b> |
| Introduction to AI-AI techniques - Problem solving with AI - AI Models, Data acquisition and aspects in AI - Problem solving- Problem solving process, Formulating problems - Problem types and characteristics - Problem space and search - Intelligent agent - Rationality and Rational agent with performance measures - Flexibility and Intelligent agents - Types of agents - Other aspects of agents - Constraint satisfaction problems (CSP) - Crypto arithmetic puzzles. |               |

|                                                                                                                                                                                                                                                                                             |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT II : Searching Technique</b>                                                                                                                                                                                                                                                        | <b>9 Hrs.</b> |
| Searching techniques- Uniformed Search - General Search Algorithm - Uniformed Search Methods - Breadth first search - Depth first search - Depth Limited search - Iterative Deepening search - Bi-directional search - Informed search- Generate and test, Best First search - A* Algorithm |               |

- AO\* research - Hill Climbing, Simulated Annealing - Mini max approach - Mini Max Algorithm  
– Alpha Beta pruning.

| <b>UNIT III : Knowledge Representation</b>                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>9 Hrs.</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <p>Knowledge and Reasoning-Approaches and issues of knowledge reasoning - Knowledge base agents - Logic-Propositional logic- Predicate logic – Syntax and semantics, instance and is relationship - Unification and Resolution, Knowledge representation using rules - Knowledge representation using semantic nets - Knowledge representation using frames - Inferences - Bayesian probability and belief network - Fuzzy logic - Dempster Shafer theory.</p> |               |

| <b>UNIT IV : Planning Logic-Based Agents, And Machine Learning Strategies</b>                                                                                                                                                                                                                                                                                                                       | <b>9 Hrs.</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <p>Planning- Planning problems, Simple planning agent - Logic Basics Planning languages - Non-linear Planning - Conditional planning - Reactive planning- Learning- Machine learning - Goals and Challenges of machine learning - Learning concepts, models - Artificial neural network based learning-Back propagation - Support vector machines - Reinforcement learning - Ensemble learning.</p> |               |

| <b>UNIT V - Applications</b>                                                                                                                                       | <b>9 Hrs.</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <p>AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition.</p> |               |

**Total Hours: 45**

| <b>TEXT BOOKS :</b> |                                                                                                                                                    |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                  | Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson, 2024. (Primary Textbook)                        |
| 2.                  | David L. Poole and Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, 3rd Edition, Cambridge University Press, 2023. |
| 3.                  | Ethem Alpaydin, Introduction to Machine Learning, 5th Edition, MIT Press, 2025.                                                                    |

**REFERENCE BOOKS :**

|    |                                                                                                                                  |
|----|----------------------------------------------------------------------------------------------------------------------------------|
| 1. | Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction, 2nd Edition, MIT Press, Reprint 2024.            |
| 2. | Kevin P. Murphy, Probabilistic Machine Learning: An Introduction, MIT Press, 2022.                                               |
| 3. | Tom M. Mitchell, Machine Learning, McGraw-Hill Education, Reprint 2023.                                                          |
| 4. | Elaine Rich, Kevin Knight, and Shivashankar B. Nair, Artificial Intelligence, McGraw-Hill Education, Latest Indian Reprint 2023. |

**WEB REFERENCES:**

|    |                                                                                                                                                 |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <a href="https://nptel.ac.in/courses/106105077">https://nptel.ac.in/courses/106105077</a>                                                       |
| 2. | <a href="https://www.geeksforgeeks.org/artificial-intelligence-tutorial/">https://www.geeksforgeeks.org/artificial-intelligence-tutorial/</a>   |
| 3. | <a href="https://www.tutorialspoint.com/artificial_intelligence/index.htm">https://www.tutorialspoint.com/artificial_intelligence/index.htm</a> |
| 4. | <a href="https://ai.google/education/">https://ai.google/education/</a>                                                                         |
| 5. | <a href="https://openai.com/research/">https://openai.com/research/</a>                                                                         |

**COs/POs/PSOs Mapping :**

| COs | Program Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    | Program Specific Outcomes (PSOs) |   |   |
|-----|------------------------|---|---|---|---|---|---|---|---|----|----|----|----------------------------------|---|---|
|     | 1                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1                                | 2 | 3 |
| 1   | 3                      | 3 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | -  | 2  | 3  | 2                                | 1 | 3 |
| 2   | 3                      | 3 | 2 | 2 | 3 | - | - | 1 | 1 | -  | 2  | 3  | 3                                | 1 | 3 |
| 3   | 3                      | 3 | 2 | 2 | 2 | - | 1 | 1 | 1 | -  | 2  | 3  | 3                                | 1 | 3 |
| 4   | 3                      | 3 | 3 | 2 | 3 | 1 | - | 1 | 1 | 1  | 3  | 3  | 3                                | 2 | 3 |
| 5   | 2                      | 2 | 3 | 2 | 3 | 2 | 1 | 1 | 2 | 1  | 3  | 3  | 3                                | 3 | 2 |

Correlation Level: 1-Low, 2-Medium, 3- High, '-' - no correlation



**BoS Chairman**

|          |                  |   |   |   |   |       |
|----------|------------------|---|---|---|---|-------|
| U25CE05B | Java Programming | L | T | P | C | Total |
|          |                  | 3 | 0 | 2 | 4 | 75    |

### COURSE OBJECTIVES:

|                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>To understand object-oriented programming concepts using Java</li> </ul>        |
| <ul style="list-style-type: none"> <li>To learn concepts such as inheritance, polymorphism, and abstraction</li> </ul> |
| <ul style="list-style-type: none"> <li>To develop programs using exception handling and multithreading</li> </ul>      |
| <ul style="list-style-type: none"> <li>To Implement file handling and I/O streams</li> </ul>                           |
| <ul style="list-style-type: none"> <li>To design GUI based applications</li> </ul>                                     |

### COURSE OUTCOMES:

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

|       |                                                                                                                           |
|-------|---------------------------------------------------------------------------------------------------------------------------|
| CO1 : | Understand the fundamentals of Java programming                                                                           |
| CO2 : | Develop object-oriented Java applications by applying concepts such as classes, objects                                   |
| CO3 : | Apply exception handling and multithreading concepts to develop robust and concurrent Java application                    |
| CO4 : | Implement Java I/O streams, file handling, serialization, generics, and lambda expressions for efficient data processing. |
| CO5 : | Design GUI-based applications and perform database connectivity using JDBC                                                |

|                                                                                                                                                         |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT I: Introduction to Java and Basics</b>                                                                                                          | <b>9 Hrs.</b> |
| Introduction to Java – History of Java-Features of Java – Java Virtual Machine (JVM) – Data types – Variables – Arrays- Operators – Control statements. |               |

|                                                                                                                                                                    |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT II: Object Oriented Programming in Java</b>                                                                                                                | <b>9 Hrs.</b> |
| Classes and Objects – Constructors – Method overloading – Inheritance – Types of inheritance – Method overriding – Polymorphism – Abstract classes and interfaces. |               |

|                                                                                                                                                                                                           |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT III: Exception Handling and Multithreading</b>                                                                                                                                                    | <b>9 Hrs.</b> |
| Fundamentals of Exception handling – Exception Types– User-defined exceptions – Multithreading – Thread life cycle – Synchronization – Inter-thread communication- Enumerations –Auto boxing- Annotations |               |

|                                                                                                                                                                     |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT IV: Java I/O and File Handling</b>                                                                                                                          | <b>9 Hrs.</b> |
| I/O Basics - Streams – Byte streams - Character streams – Reading and writing files - File handling – Serialization – Generics-Ambiguity Errors –Lambda Expressions |               |

|                                                                                                                                                                                                                                |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT V: GUI Programming and Database Connectivity Using Java</b>                                                                                                                                                            | <b>9 Hrs.</b> |
| Introduction to AWT and Swing – Event handling – Introduction to JDBC- Types of JDBC Drivers - JDBC Packages - JDBC API and Driver – Associating the JDBC/ODBC bridge with the Database - Database Connections and Operations. |               |

**Total Hours: 45**

### **List of Exercises**

1. Write a Java program to display "Hello, Java!" and print your name, department, and college name.
2. Write a Java program to accept two numbers from the user and perform arithmetic operations (+, –, ×, ÷, %). Use conditional statements to find the larger number.
3. Write a Java program to create a class Student with data members and member functions. Create an object and display the student details using a constructor.
4. Write a Java program to demonstrate inheritance by creating a class Person and a derived class Student. Display the details of both classes.
5. Write a Java program to demonstrate exception handling by dividing two numbers and handling Arithmetic Exception using try, catch, and finally blocks.
6. Write a Java program to create two threads. One thread should print numbers from 1 to 5, and the other thread should print alphabets from A to E.
7. Write a Java program to create a text file, write a few lines into the file, and read the contents from the file.
8. Write a Java program to copy the contents of one text file to another using file streams.
9. Write a Java Swing program to create a simple login form with username and password fields and a login button. Display a message when the button is clicked.
10. Write a Java program using JDBC to connect to a MySQL database and display all records from a Student table.

**Total Hours: 30**

| TEXT BOOKS : |                                                                                                 |
|--------------|-------------------------------------------------------------------------------------------------|
| 1.           | Herbert Schildt, Java: The Complete Reference, 13th Edition, McGraw-Hill Education, 2024        |
| 2.           | Aamer Khan, “Java Programming Language   Learn Java from Basic to Advance”, Code Academy, 2022. |
| 3.           | E. Balagurusamy ,”Programming with Java” 7th Edition, McGraw Hill Education, New Delhi, 2024.   |

| REFERENCE BOOKS : |                                                                                       |
|-------------------|---------------------------------------------------------------------------------------|
| 1.                | Tripti Paul, “Object-Oriented Programming Using Java”, Cengage Learning, 2018.        |
| 2.                | Cay S. Horstmann, Gary Cornell, “Core Java Volume I”, 10th Edition,Pearson,2016.      |
| 3.                | Deitel & Deitel, “Java: How to Program”,11th Edition,Pearson,2018.                    |
| 4.                | Kathy Sierra, Bert Bates, “Head First Java”,3rd Edition , O’Reilly,2022.              |
| 5.                | S. Malhotra, S. Chudhary,”Programming in Java”, 2nd edition, Oxford Univ. Press,2012. |

| WEB REFERENCES: |                                                                                                                                                                                                                                 |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.              | <a href="https://www.tutorialspoint.com/java/index.htm">https://www.tutorialspoint.com/java/index.htm</a>                                                                                                                       |
| 2.              | <a href="https://onlinecourses.nptel.ac.in/noc22_cs47">https://onlinecourses.nptel.ac.in/noc22_cs47</a>                                                                                                                         |
| 3.              | <a href="https://azure.microsoft.com/en-in/resources/cloud-computing-dictionary/what-is-java-programming-language">https://azure.microsoft.com/en-in/resources/cloud-computing-dictionary/what-is-java-programming-language</a> |
| 4.              | <a href="https://www.programiz.com/java-programming">https://www.programiz.com/java-programming</a>                                                                                                                             |

| COs/POs/PSOs Mapping : |                        |   |   |   |   |   |   |   |   |    |    |    |                                  |   |   |
|------------------------|------------------------|---|---|---|---|---|---|---|---|----|----|----|----------------------------------|---|---|
| COs                    | Program Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    | Program Specific Outcomes (PSOs) |   |   |
|                        | 1                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1                                | 2 | 3 |
| 1                      | 3                      | 2 | 1 | - | 2 | - | - | - | - | 1  | -  | 1  | 3                                | 1 | - |
| 2                      | 3                      | 3 | 3 | 1 | 2 | - | - | - | 1 | 1  | -  | 1  | 3                                | 3 | 2 |
| 3                      | 2                      | 3 | 3 | 1 | 2 | 2 | 2 | 1 | 1 | -  | 1  | 2  | 3                                | 2 | 2 |

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 2 | 3 | 3 | 1 | 3 | 1 | 1 | 1 | - | - | - | 2 | 3 | 3 | 2 |
| 5 | 3 | 3 | 3 | 2 | 3 | 1 | 2 | - | 2 | 2 | 1 | 1 | 3 | 3 | 3 |

Correlation Level: 1-Low, 2-Medium, 3- High, '-' - no correlation



*BoS Chairman*

**BoS Chairman**

|          |                          |   |   |   |   |       |
|----------|--------------------------|---|---|---|---|-------|
| U25BA10T | Total Quality Management | L | T | P | C | Total |
|          |                          | 2 | 0 | 0 | 2 | 30    |

#### COURSE OBJECTIVES:

|                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>To provide students with a comprehensive understanding of Total Quality Management (TQM) principles, concepts and quality philosophies</li> </ul>                 |
| <ul style="list-style-type: none"> <li>To familiarize students with customer-focused quality practices and continuous improvement methodologies for organizational excellence</li> </ul>                 |
| <ul style="list-style-type: none"> <li>To develop the ability to apply statistical quality control techniques and quality management tools for decision making and process improvement</li> </ul>        |
| <ul style="list-style-type: none"> <li>To enable students to evaluate quality systems, benchmarking practices, and performance improvement frameworks across organizations</li> </ul>                    |
| <ul style="list-style-type: none"> <li>To equip students with knowledge of quality implementation strategies, leadership practices, quality audits, and emerging trends in quality management</li> </ul> |

#### COURSE OUTCOMES:

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

|       |                                                                                                        |
|-------|--------------------------------------------------------------------------------------------------------|
| CO1 : | Understand quality concepts and philosophies of TQM.                                                   |
| CO2 : | Apply TQM principles and concepts of continuous improvement.                                           |
| CO3 : | Apply and analyze the quality tools, management tools and statistical fundamentals to improve quality. |
| CO4 : | Understand the TQM tools as a means to improve quality.                                                |
| CO5 : | Evaluate quality systems and implementation practices for organizational excellence.                   |

|                                                                                                                                                                                                                                                                                                   |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT I : Introduction To Quality Management</b>                                                                                                                                                                                                                                                | <b>6 Hrs.</b> |
| Introduction to TQM – TQM framework, benefits, awareness and obstacles. Quality – vision - mission and policy statements. Customer Focus – customer perception of quality - Translating needs into requirements - customer retention. Dimensions of product and service quality. Cost of quality. |               |

|                                                                                                                                                                                                                                                                                    |               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT II : Principles And Philosophies Of Quality Management</b>                                                                                                                                                                                                                 | <b>6 Hrs.</b> |
| Overview of the contributions of Deming, Juran Crosby - Masaaki Imai – Feigenbaum – Ishikawa - Taguchi techniques — introduction - loss function - parameter and tolerance design - signal to noise ratio. Concepts of Quality circle - Japanese 5S principles and 8D methodology. |               |

|                                                                                                                                                                                                                                      |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT III : Statistical Process Control</b>                                                                                                                                                                                        | <b>6 Hrs.</b> |
| Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed. Process capability – meaning - significance and measurement – Six sigma concepts of process capability. |               |

|                                                                                                                                                                                                                                                                                                                                             |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT IV : Tools And Techniques For Quality Management</b>                                                                                                                                                                                                                                                                                | <b>6 Hrs.</b> |
| Benefits, Voice of customer - information organization - House of quality (HOQ) - building a HOQ - QFD process. Failure mode effect analysis (FMEA) — requirements of reliability - failure rate - FMEA stages – design - process and documentation. Seven old (statistical) tools. Seven new management tools. Benchmarking and POKA YOKE. |               |

|                                                                                                                                                                                                                                                                                                           |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT V : Quality Systems Organizing And Implementation</b>                                                                                                                                                                                                                                             | <b>6 Hrs.</b> |
| Introduction to ISO 9001:2015 – Quality Management Systems - Overview of ISO 9004:2018 – Guidelines for performance improvements. Quality Audits. TQM culture - Leadership – quality council - employee involvement – motivation - empowerment, recognition and reward- Introduction to software quality. |               |

**Total Hours: 30**

| <b>TEXT BOOKS :</b> |                                                                                                                                                          |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                  | Oakland, J. S., Total Quality Management and Operational Excellence: Text with Cases, 5th Edition, Routledge, 2014.                                      |
| 2.                  | Bhat, K. S., Total Quality Management: Text and Cases, Himalaya Publishing House, Revised Edition, 2018.                                                 |
| 3.                  | Besterfield, D. H., Besterfield-Michna, C., Besterfield, G. H., & Besterfield-Sacre, M., Total Quality Management, 3rd Edition, Pearson Education, 2011. |

|    |                                                                                                                                              |
|----|----------------------------------------------------------------------------------------------------------------------------------------------|
| 4. | Goetsch, D. L., & Davis, S. B., Quality Management for Organizational Excellence: Introduction to Total Quality, 9th Edition, Pearson, 2021. |
| 5. | Evans, J. R., & Lindsay, W. M., Managing for Quality and Performance Excellence, 11th Edition, Cengage Learning, 2020.                       |

#### REFERENCE BOOKS :

|    |                                                                                                                                                  |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Feigenbaum, A. V., Total Quality Control, 4th Edition, McGraw-Hill Education, 2004.                                                              |
| 2. | Juran, J. M., & De Feo, J. A., Juran's Quality Handbook: The Complete Guide to Performance Excellence, 7th Edition, McGraw-Hill Education, 2017. |
| 3. | Pyzdek, T., & Keller, P. A., The Six Sigma Handbook, 5th Edition, McGraw-Hill Education, 2021.                                                   |
| 4. | Ishikawa, K., What Is Total Quality Control? The Japanese Way, Prentice Hall, Reprint Edition, 1985.                                             |
| 5. | Taguchi, G., Chowdhury, S., & Wu, Y., Taguchi's Quality Engineering Handbook, John Wiley & Sons, 2005.                                           |

#### WEB REFERENCES :

|    |                                                                                               |
|----|-----------------------------------------------------------------------------------------------|
| 1. | <a href="https://asq.org/">https://asq.org/</a>                                               |
| 2. | <a href="https://www.iso.org/standard/70397.html">https://www.iso.org/standard/70397.html</a> |
| 3. | <a href="https://www.isixsigma.com/">https://www.isixsigma.com/</a>                           |
| 4. | <a href="https://www.quality.org/">https://www.quality.org/</a>                               |
| 5. | <a href="https://www.nist.gov/mep">https://www.nist.gov/mep</a>                               |

#### COs/POs/PSOs Mapping :

| COs | Program Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    | Program Specific Outcomes (PSOs) |   |   |
|-----|------------------------|---|---|---|---|---|---|---|---|----|----|----|----------------------------------|---|---|
|     | 1                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1                                | 2 | 3 |
| 1   | 2                      | 2 | – | – | 1 | 2 | 2 | – | 1 | 1  | –  | –  | –                                | – | 2 |
| 2   | 2                      | 3 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 1  | 2  | 1  | 1                                | 2 | 2 |
| 3   | 3                      | 3 | 2 | 3 | 3 | 1 | 2 | 1 | 1 | –  | 1  | 1  | 2                                | 3 | 2 |

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 2 | 3 | 3 | 2 | 3 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 2 |
| 5 | 2 | 2 | 1 | 1 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 3 |

Correlation Level: 1-Low, 2-Medium, 3- High, '-' - no correlation



**BoS Chairman**



|          |                       |   |   |   |   |       |
|----------|-----------------------|---|---|---|---|-------|
| U25VA06T | Constitution of India | L | T | P | C | Total |
|          |                       | 1 | 0 | 0 | 0 | 15    |

#### COURSE OBJECTIVES:

|                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>To study the Constituent Assembly debates and philosophical foundations of the Indian Constitution</li> </ul>                             |
| <ul style="list-style-type: none"> <li>To examine the Preamble, Fundamental Rights, Directive Principles, and Duties as guiding values</li> </ul>                                |
| <ul style="list-style-type: none"> <li>To understand the structure, powers, and functions of the Union Government including President, Prime Minister, and Parliament</li> </ul> |
| <ul style="list-style-type: none"> <li>To study the organization and functioning of State Governments including Governor, Chief Minister, and Legislature</li> </ul>             |
| <ul style="list-style-type: none"> <li>To assess the role of the Supreme Court, High Courts, and judicial review in safe guarding constitutional values.</li> </ul>              |

#### COURSE OUTCOMES:

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

|             |                                                                                                       |
|-------------|-------------------------------------------------------------------------------------------------------|
| <b>CO1:</b> | Describe the historical and philosophical foundations of the Indian Constitution.                     |
| <b>CO2:</b> | Interpret the Fundamental Rights, Duties, Directive Principles, and Constitutional Remedies of India. |
| <b>CO3:</b> | Summarize the powers and functions of the Union Executive and Parliament.                             |
| <b>CO4:</b> | Evaluate the roles and responsibilities of the State Executive and Legislature.                       |
| <b>CO5:</b> | Analyze the structure and role of the Indian Judiciary in upholding constitutional governance.        |

|                                                                                                                                                                                                                                                         |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT I : Historical Background and Making of the Constitution</b>                                                                                                                                                                                    | <b>3 Hrs.</b> |
| Historical background of the Indian Constitution – Constituent Assembly – Framing of the Constitution – Preamble – Salient Features of the Constitution – Citizenship – Union and its Territory – Constitutional Amendments – Basic Structure Doctrine. |               |

|                                                                                                                                                                                                                                                                                                                            |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT II : Fundamental Rights and Directive Principles</b>                                                                                                                                                                                                                                                               | <b>3 Hrs.</b> |
| Fundamental Rights – Right to Equality – Right to Freedom – Right against Exploitation – Right to Freedom of Religion – Cultural and Educational Rights – Right to Constitutional Remedies – Directive Principles of State Policy – Fundamental Duties – Relationship between Fundamental Rights and Directive Principles. |               |

|                                                                                                                                                                                                                                             |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT III : Union Government</b>                                                                                                                                                                                                          | <b>3 Hrs.</b> |
| President – Vice President – Prime Minister – Council of Ministers – Parliament – Lok Sabha – Rajya Sabha – Legislative Procedure – Money Bills – Constitutional Authorities – Election Commission – Comptroller and Auditor General (CAG). |               |

|                                                                                                                                                                                                                                     |               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT IV : State Government and Local Self-Government</b>                                                                                                                                                                         | <b>3 Hrs.</b> |
| Governor – Chief Minister – Council of Ministers – State Legislature – High Courts – Centre–State Relations – Panchayati Raj Institutions – Municipal Administration – Constitutional Provisions relating to Local Self-Government. |               |

|                                                                                                                                                                                                                                                                                            |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>UNIT V : Judiciary and Constitutional Governance</b>                                                                                                                                                                                                                                    | <b>3 Hrs.</b> |
| Supreme Court of India – Judicial Review – Judicial Activism – Public Interest Litigation (PIL) – Independence of Judiciary – Emergency Provisions – Constitutional Amendment Procedure – Constitutional Values – Rule of Law – Good Governance – Rights and Responsibilities of Citizens. |               |

**Total Hours: 15**

| <b>TEXT BOOKS :</b> |                                                                                       |
|---------------------|---------------------------------------------------------------------------------------|
| 1.                  | Basu, D. D. (2022). Introduction to the Constitution of India (26th ed.). LexisNexis. |
| 2.                  | Laxmikanth, M. (2024). Indian Polity (7th ed.). McGraw Hill Education.                |

| <b>REFERENCE BOOKS :</b> |                                                                                                              |
|--------------------------|--------------------------------------------------------------------------------------------------------------|
| 1.                       | Pandey, J. N. (2024). Constitutional law of India (61st ed.). Central Law Agency.                            |
| 2.                       | Bakshi, P. M. (2023). The Constitution of India (18th ed.). Universal Law Publishing.                        |
| 3.                       | Shukla, V. N. (2023). Constitution of India (14th ed., revised by Mahendra Pal Singh). Eastern Book Company. |

|    |                                                                               |
|----|-------------------------------------------------------------------------------|
| 4. | Jain, M. P. (2021). Constitutional government in India (8th ed.). LexisNexis. |
| 5. | Kashyap, S. C. (2020). Our constitution. National Book Trust.                 |

#### WEB REFERENCES :

|    |                                                                                           |
|----|-------------------------------------------------------------------------------------------|
| 1. | <a href="https://nptel.ac.in/courses/129106003">https://nptel.ac.in/courses/129106003</a> |
| 2. | <a href="https://nptel.ac.in/courses/129106411">https://nptel.ac.in/courses/129106411</a> |
| 3. | <a href="https://nptel.ac.in/courses/129105608">https://nptel.ac.in/courses/129105608</a> |

#### COs/POs/PSOs Mapping :

| COs | Program Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    | Program Specific Outcomes (PSOs) |   |   |
|-----|------------------------|---|---|---|---|---|---|---|---|----|----|----|----------------------------------|---|---|
|     | 1                      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1                                | 2 | 3 |
| 1   | –                      | – | – | – | – | 2 | 1 | 2 | – | 1  | –  | 2  | –                                | – | – |
| 2   | –                      | – | – | – | – | 3 | 2 | 3 | 1 | 2  | –  | 2  | –                                | – | 1 |
| 3   | –                      | 1 | – | – | – | 3 | – | 2 | 1 | 2  | 2  | 1  | –                                | – | 1 |
| 4   | –                      | 2 | – | – | – | 3 | 2 | 2 | 2 | 2  | 2  | 1  | –                                | 1 | 1 |
| 5   | –                      | 2 | – | 1 | – | 3 | 2 | 3 | 1 | 2  | 1  | 2  | –                                | 2 | 1 |

Correlation Level: 1-Low, 2-Medium, 3- High, '–' - no correlation



**BoS Chairman**

|          |                               |   |   |   |   |     |
|----------|-------------------------------|---|---|---|---|-----|
| U25SE02P | Skill Enhancement Course – II | L | T | P | C | Hrs |
|          |                               | 0 | 0 | 1 | 0 | 15  |

The students must select certification courses from reputed organizations such as Texas Instruments, ARM, MATLAB, Intel, Cisco, NPTEL, AWS, Raspberry Pi, Xilinx, and Key sight, with a duration of 40–50 hours specified in the curriculum and offered through Centres of Excellence.

#### Course Duration and Evaluation

- The duration is **40–50 hours** as specified in the curriculum and will be offered through the Centre of Excellence.
- **Pass/Fail** will be determined based on participation, attendance, performance, and completion of the course.
- If a student fails, he/she has to repeat the course in the subsequent years.
- Passing this course is mandatory for the award of the degree.

| Provider                 | Sample Courses<br>(40–50 hrs)                           | Platform/Link                                                                                                   |
|--------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>MATLAB</b>            | MATLAB Onramp and Simulink Fundamentals                 | <a href="https://matlabacademy.mathworks.com">https://matlabacademy.mathworks.com</a>                           |
| <b>Texas Instruments</b> | Embedded Systems and MSP430 Microcontroller Programming | <a href="https://training.ti.com">https://training.ti.com</a>                                                   |
| <b>ARM</b>               | ARM Cortex-M Embedded Systems Fundamentals              | <a href="https://developer.arm.com">https://developer.arm.com</a>                                               |
| <b>Intel</b>             | FPGA Design and Development Fundamentals                | <a href="https://www.intel.com/content/www/us/en/training">https://www.intel.com/content/www/us/en/training</a> |
| <b>Cisco</b>             | Introduction to IoT and Networking                      | <a href="https://www.netacad.com">https://www.netacad.com</a>                                                   |
| <b>AWS</b>               | IoT Foundations and Cloud for IoT                       | <a href="https://aws.training">https://aws.training</a>                                                         |

|                                      |                                                                |                                                                                                       |
|--------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>Raspberry Pi</b>                  | IoT and Embedded Systems                                       | <a href="https://projects.raspberrypi.org">https://projects.raspberrypi.org</a>                       |
| <b>Xilinx (AMD)</b>                  | FPGA Design using Vivado                                       | <a href="https://www.xilinx.com/support/training">https://www.xilinx.com/support/training</a>         |
| <b>Keysight</b>                      | RF and Wireless Communication Fundamentals                     | <a href="https://education.keysight.com">https://education.keysight.com</a>                           |
| <b>NPTEL</b>                         | Internet of Things / Embedded System Design / VLSI Design Flow | <a href="https://nptel.ac.in">https://nptel.ac.in</a>                                                 |
| <b>Cadence</b>                       | VLSI Design and Verification Basics                            | <a href="https://www.cadence.com">https://www.cadence.com</a>                                         |
| <b>Siemens EDA (Mentor Graphics)</b> | PCB Design and Electronic System Design                        | <a href="https://eda.sw.siemens.com">https://eda.sw.siemens.com</a>                                   |
| <b>Palo Alto Networks</b>            | Cybersecurity Fundamentals for Connected Devices               | <a href="https://www.paloaltonetworks.com/cyberpedia">https://www.paloaltonetworks.com/cyberpedia</a> |
| <b>Oracle</b>                        | AI Foundations for Engineers                                   | <a href="https://education.oracle.com">https://education.oracle.com</a>                               |
| <b>Google</b>                        | Generative AI for Engineers                                    | <a href="https://grow.google">https://grow.google</a>                                                 |



**BoS Chairman**