**DEPARTMENTOFCOMPUTER SCIENCE AND ENGINEERING**

**CO- PO MATRICES OF ALL SEMESTER COURSES**

**ACADEMIC YEAR 2025-26**

| | |
|---|---|
| **Year & Sem:** | **II & III** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS301 - Data Structures and Algorithms** |

**COURSE OUTCOMES (COs)**

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Explain abstract data types | Understand(K2) |
| **CO2** | Apply and analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications | Analyze (K4) |
| **CO3** | Apply searching, sorting, and hashing algorithms to solve real-world problems. | Apply (K3) |
| **CO4** | Implement effectively and analyze various tree structures to solve computational problems for efficient data management. | Apply (K3) |
| **CO5** | Implement efficient graph algorithms and Analyze graph modeling to solve them. | Apply (K3) |

**CO-PO MATRICES**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 2 | 2 | 3 | 1 | - | - | - | 2 | - | 2 | 1 | 1 | 1 | 1 |
| **CO2** | 2 | 3 | 2 | 2 | 2 | - | - | - | 2 | - | 2 | 2 | 3 | 2 | 2 |
| **CO3** | 2 | 2 | 3 | 2 | 3 | - | - | - | 3 | - | 2 | 2 | 3 | 2 | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 1 | - | - | - | 3 | - | 2 | 2 | 3 | 2 | 2 |
| **CO5** | 3 | 3 | 3 | 3 | 1 | - | - | - | 3 | - | 2 | 2 | 3 | 2 | 2 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & III** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS302 - Foundations of Data Science** |

**COURSE OUTCOMES (COs)**

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Understand the data science process | Understand(K2) |
| **CO2** | Understand different types of data description for data science process | Understand (K2 |
| **CO3** | Explain the relationships between data in data science | Understand (K2) |
| **CO4** | Use the Python Libraries for Data Wrangling | Apply (K3) |
| **CO5** | Apply visualization Libraries in Python to interpret and explore data | Apply (K3) |

**CO-PO MATRICES**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 3 | 3 | 3 | 1 | 1 | 2 | 2 | 3 | 2 | 2 | 2 | 2 |
| **CO2** | 2 | 2 | 2 | 3 | 3 | 1 | - | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| **CO3** | 2 | 3 | 2 | 2 | 3 | - | - | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| **CO4** | 2 | 2 | 2 | 2 | 3 | 1 | 1 | - | 2 | 2 | 3 | 3 | 2 | 3 |
| **CO5** | 2 | 2 | 3 | 2 | 3 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 2 | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & III** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS303 - Object Oriented Programming using Java** |

## COURSE OUTCOMES (COs)

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Summarize classes with access controls to create objects for real world scenarios. | Understanding(K2) |
| **CO2** | Utilize the principle of Inheritance, Packages and Interface. | Apply (K3) |
| **CO3** | Use of exception handling mechanisms and multithreaded model to solve real world problems | Apply (K3) |
| **CO4** | Illustrate Java applications with I/O packages, string classesand generics concepts | Understand(K2) |
| **CO5** | Develop and Design Graphical User Interface Application using JAVAFX. | Apply (K3) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 1 | 3 | 1 | 3 | - | - | - | 3 | 2 | 2 | 2 | 3 | 1 | 2 |
| **CO2** | 2 | 1 | 3 | 2 | 1 | - | - | - | 2 | 1 | 1 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 1 | 2 | 2 | - | - | - | 3 | 2 | 1 | 2 | 3 | 1 | 3 |
| **CO4** | 3 | 1 | 2 | 2 | 2 | - | - | - | 1 | 2 | 1 | 3 | 3 | 1 | 1 |
| **CO5** | 1 | 1 | 2 | 3 | 2 | - | - | - | 3 | 2 | 1 | 2 | 3 | 3 | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & III** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS311 - Data Science Laboratory** |

## COURSE OUTCOMES (COs)

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Use of the python libraries for data science | Apply (K3) |
| **CO2** | Use of the basic Statistical and Probability measures for data science. | Apply (K3) |
| **CO3** | Applydescriptive analytics on the benchmark data sets. | Apply (K3) |
| **CO4** | Applycorrelation and regression analytics on standard data sets | Apply(K3) |
| **CO5** | Interpret data using visualization packages in Python. | Apply (K3) |

## CO-PO MATRICES

| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 1 | - | - | - | - | 1 | 3 | 3 | 3 | 2 | 2 | 2 |
| **CO2** | 3 | 2 | 2 | 3 | 1 | - | - | - | 3 | 1 | 3 | 2 | 2 | 2 | 2 |
| **CO3** | 3 | 2 | 1 | 3 | 1 | - | - | - | 2 | 1 | 1 | 1 | 3 | 2 | 2 |
| **CO4** | 2 | 3 | 1 | 3 | - | - | - | - | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 1 | 2 | 3 | 1 | 1 | - | - | - | 2 | 1 | 3 | 1 | 3 | 3 | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & III** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS312 - Object Oriented Programming using Java Laboratory** |

**COURSE OUTCOMES (COs)**

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Implement the simple java programs using object-oriented programming concepts | Apply (K3) |
| **CO2** | Illustrate simple applications using package and exceptions. | Understand (K2) |
| **CO3** | Implement the applications using multithreading and files. | Apply (K3) |
| **CO4** | Create GUIs and event driven programming applications. | Create (K6) |
| **CO5** | Execute the real-world problem in team by applying the appropriate features of object-oriented programming paradigm with best practices and document its methodology | Apply (K3) |

**CO-PO MATRICES**

| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 1 | 2 | 1 | 2 | - | - | - | 1 | 2 | 2 | 2 | 1 | 2 | 3 |
| **CO2** | 2 | 1 | 3 | 1 | 2 | - | - | - | 2 | 3 | 3 | 2 | 1 | 3 | 1 |
| **CO3** | 2 | 2 | 1 | 2 | 2 | - | - | - | 1 | 2 | 1 | 3 | 2 | 3 | 2 |
| **CO4** | 2 | 2 | 1 | 3 | 2 | - | - | - | 3 | 1 | 1 | 1 | 2 | 1 | 2 |
| **CO5** | 1 | 3 | 3 | 1 | 2 | - | - | - | 1 | 1 | 1 | 1 | 2 | 1 | 2 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & IV** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS401 Artificial Intelligence And Machine Learning** |

## COURSE OUTCOMES (COs)

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Demonstrate the concepts of AI problems and use appropriate search algorithms for problem solving | Apply (K3) |
| **CO2** | Apply reasoning under uncertainty and predicate logic methods for knowledge representation. | Apply (K3) |
| **CO3** | Implement supervised learning models for different Artificial Intelligence approaches to resolving a problem. | Apply (K3) |
| **CO4** | Demonstrate ensembling and unsupervised models to AI techniques in machine learning. | Apply (K3) |
| **CO5** | Illustrate the evaluation of the various algorithms and build deep learning neural network models. | Understand(K2) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 3 | 3 | - | - | - | - | 1 | 3 | 3 | 3 | 1 | 2 | 2 |
| **CO2** | 1 | 1 | 1 | 3 | 1 | - | - | - | 1 | 2 | 1 | 3 | 2 | 3 | 2 |
| **CO3** | 2 | 1 | 2 | 1 | 1 | - | - | - | 2 | 1 | 1 | 3 | 1 | 1 | 1 |
| **CO4** | 3 | 1 | 3 | 1 | - | - | - | - | 2 | 1 | 2 | 1 | 2 | 2 | 2 |
| **CO5** | 3 | **1** | 1 | 2 | 2 | - | - | - | 3 | 1 | 2 | 3 | 2 | 1 | 2 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & IV** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS402 Database Management Systems** |

## COURSE OUTCOMES (COs)

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Construct SQL Queries using relational algebra | Apply(K3) |
| **CO2** | Make use of design database using ER model and normalize the database | Apply(K3) |
| **CO3** | Utilize queries to handle transaction processing and maintain consistency of the database | Apply(K3) |
| **CO4** | Examine various indexing strategies and apply the knowledge to tune the performance of the database | Analyze(K4) |
| **CO5** | Justify how advanced databases differ from Relational Databases and find a suitable database for the given requirement | Evaluate(K5) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 3 | 2 | 1 | - | - | - | 2 | 1 | 1 | 1 | 1 | 1 | - |
| **CO2** | 3 | 1 | 1 | 1 | 1 | - | - | - | 2 | 3 | 3 | 3 | 2 | 2 | - |
| **CO3** | 3 | 2 | 3 | 2 | 1 | - | - | - | 2 | 1 | 1 | 2 | 2 | 2 | - |
| **CO4** | 1 | 2 | 3 | 2 | - | - | - | - | 3 | 2 | 2 | 3 | 2 | 2 | - |
| **CO5** | 1 | 1 | 3 | 3 | 2 | - | - | - | 1 | 3 | 3 | 1 | 2 | 2 | - |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & IV** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS403 Object Oriented Software Engineering** |

**COURSE OUTCOMES (COs)**

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Understand software engineering concepts and agile development methods (K2). | Understand(K2) |
| **CO2** | Analyze and model software requirements using UML and tools (K4). | Analyze (K4) |
| **CO3** | Design software systems using modern patterns and architectures (K5). | Design(K5) |
| **CO4** | Apply testing techniques and tools for software quality assurance (K3). | Apply (K3) |
| **CO5** | Develop software projects using risk management, scheduling, and DevOps practices (K5). | Develop (K5) |

**CO-PO MATRICES**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 1 | 2 | 2 | - | - | - | - | 1 | 1 | 2 | 2 | 2 | 1 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | - | - | - | - | 2 | 2 | 3 | 3 | 2 | 2 |
| **CO3** | 2 | 3 | 3 | 2 | 2 | - | - | - | - | 2 | 2 | 3 | 2 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | - | - | - | - | 2 | 2 | 3 | 2 | 3 | 2 |
| **CO5** | 2 | 3 | 2 | 2 | 3 | - | - | - | - | 1 | 2 | 2 | 3 | 2 | 2 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & IV** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS404 Operating Systems** |

## COURSE OUTCOMES (COs)

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Explain the evolution, objectives, and types of operating systems, including their structure, system calls, and security measures. | K2 (Understand) |
| **CO2** | Analyze process management techniques such as process scheduling, inter-process communication, synchronization, and deadlock handling. | K4 (Analyze) |
| **CO3** | Apply memory management strategies, including paging, segmentation, and virtual memory, to solve allocation and performance issues. | K3 (Apply) |
| **CO4** | Demonstrate the functioning of storage systems, disk scheduling, and file systems, and assess their implementation methods. | K4 (Analyze) |
| **CO5** | Evaluate case studies of operating systems like Linux, iOS, Android, and RTOS, and discuss challenges in modern hardware and virtualization. | K5 (Evaluate) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 1 | 2 | 2 | - | - | - | - | 3 | 2 | 3 | 3 | 1 | 1 | 2 |
| **CO2** | 2 | 2 | 3 | 1 | 1 | - | - | - | 2 | 1 | 2 | 1 | 2 | 2 | 1 |
| **CO3** | 1 | 3 | 2 | 2 | 1 | - | - | - | 2 | 2 | 1 | 1 | 1 | 1 | 2 |
| **CO4** | 1 | 3 | 3 | 3 | - | - | - | - | 1 | 2 | 1 | 1 | 2 | 1 | 3 |
| **CO5** | 3 | 1 | 2 | 1 | 1 | - | - | - | 3 | 2 | 3 | 3 | 2 | 2 | 2 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & IV** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS405-Theory Of Computation** |

## COURSE OUTCOMES (COs)

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Construct deterministic and nondeterministic finite automata (DFA and NFA) for given languages. | K3 |
| **CO2** | Develop regular expressions and regular languages for given problems | K3 |
| **CO3** | Construct context-free grammars and parse trees for specific languages | K3 |
| **CO4** | Design pushdown automata (PDA) for context-free languages using acceptance by final state or empty stack. | K3 |
| **CO5** | Explain the concept of Turing machines and their role in language acceptance | K2 |

## CO-PO MATRICES

| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 | 3 |
| **CO2** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | - | - | - | - | - | - | - | 3 | 3 | 2 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & IV** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS406 Design And Analysis Of Algorithms** |

**COURSE OUTCOMES (COs)**

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Analyze the time complexity of algorithm using various asymptotic notations | Analyze (K4) |
| **CO2** | Compute solution for the given problem using Brute force and Divide and Conquer techniques. | Apply (K3) |
| **CO3** | Apply Dynamic programming and Greedy techniques to solve the problems. | Apply (K3) |
| **CO4** | Use Backtracking and Branch & Bound techniques to solve the problems. | Apply (K3) |
| **CO5** | Use approximation algorithms and randomized algorithms to solve the problems. | Apply (K3) |

**CO-PO MATRICES**

| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | - | 2 | - | - | - | 1 | - | - | - | - | 1 | - | - |
| **CO3** | 3 | 2 | - | 2 | - | - | - | 1 | - | - | - | - | 1 | - | - |
| **CO4** | 3 | 2 | - | 2 | - | - | - | 1 | - | - | - | - | 1 | - | - |
| **CO5** | 3 | 2 | - | 2 | - | - | - | 1 | - | - | - | - | 1 | - | - |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & IV** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS411-Database Management Systems Laboratory** |

## COURSE OUTCOMES (COs)

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Implement the databases with different types of key constraints. | Apply (K3) |
| **CO2** | Construct simple and complex SQL queries using DML and DCL commands. | Apply (K3) |
| **CO3** | Use advanced features such as stored procedures and triggers and incorporate in GUI based application development. | Apply (K3) |
| **CO4** | Implement an XML database and validate with meta-data (XML schema). | Apply (K3) |
| **CO5** | Implement and manipulate data using NOSQL database. | Apply (K3) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 1 | - | - | - | 3 | 1 | 3 | 2 | 1 | 1 | - |
| **CO2** | 2 | 2 | 3 | 2 | 2 | - | - | - | 1 | 2 | 3 | 3 | 2 | 2 | - |
| **CO3** | 3 | 3 | 2 | 1 | 1 | - | - | - | 1 | 1 | 1 | 3 | 2 | 2 | - |
| **CO4** | 1 | 3 | 3 | 3 | 1 | - | - | - | 1 | 1 | 3 | 2 | 2 | 2 | - |
| **CO5** | 2 | 3 | 2 | 2 | 1 | - | - | - | 2 | 2 | 3 | 1 | 2 | 2 | - |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **II & IV** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS412 Operating System Laboratory** |

**COURSE OUTCOMES (COs)**

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Illustrate and define the Linux Commands. | Understand (K2) |
| **CO2** | Compare the performance of various CPU Scheduling Algorithms. | Analyze (K4) |
| **CO3** | Utilize the different algorithms for process communication and synchronization | Apply (K3) |
| **CO4** | Implement the programs to implement deadlock avoidance algorithms, semaphores and IPC | Apply (K3) |
| **CO5** | Implement pthe programs to implement various page replacement algorithms, file organization and file allocation strategies | Apply (K3) |

**CO-PO MATRICES**

| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 1 | 3 | 1 | 1 | - | - | - | 1 | 3 | 3 | 3 | 2 | 1 | 3 |
| **CO2** | 3 | 1 | 1 | 2 | 2 | - | - | - | 3 | 2 | 1 | 1 | 3 | 1 | 2 |
| **CO3** | 3 | 3 | 2 | 1 | 2 | - | - | - | 3 | 3 | 1 | 2 | 2 | 2 | 2 |
| **CO4** | 1 | 2 | 2 | 3 | 2 | - | - | - | 3 | 1 | 3 | 1 | 1 | 2 | 1 |
| **CO5** | 2 | 2 | 1 | 1 | 3 | - | - | - | 1 | 2 | 2 | 3 | 1 | 3 | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & V** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS501- Computer Networks** |

**COURSE OUTCOMES (COs)**

| **On completion of the course, the students will be able to** | | **Bloom's Level Mapped** |
|---|---|---|
| **CO1** | Describe the components and functions of data communication and physical layer. | Understand (K2) |
| **CO2** | Discuss the data flows from one node to another using DLC services. | Understand (K2) |
| **CO3** | Compare various routing algorithms. | Understand (K2) |
| **CO4** | Describe protocols for various mechanisms in the transport layer. | Understand (K2) |
| **CO5** | Illustrate the working of various application layer protocols. | Understand (K2) |

**CO-PO MATRICES**

| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | – | 2 | – | – | 2 | – | – | – | – | – | – | 3 | – | – |
| **CO2** | – | 1 | – | – | 2 | – | – | – | – | – | – | 2 | 2 | – |
| **CO3** | – | 2 | – | – | 3 | – | – | – | – | – | – | – | 3 | – |
| **CO4** | – | – | 1 | 2 | – | – | – | – | 3 | – | – | – | – | – |
| **CO5** | – | 3 | 2 | – | – | – | – | – | – | – | – | – | – | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & V** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS902- Distributed Computing** |

## COURSE OUTCOMES (COs)

| On completion of the course, the students will be able to | | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Explain core concepts of distributed systems and their models. | Understanding (K2) |
| **CO2** | Analyze time coordination and global state in distributed systems. | Analyzing (K4) |
| **CO3** | Apply distributed algorithms for mutual exclusion and deadlock detection. | Applying (K3) |
| **CO4** | Apply agreement algorithms and recovery mechanisms. | Applying (K3) |
| **CO5** | Explore and utilize cloud computing technologies, models, and services. | Applying (K3) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | 2 | - | - | - | - | 2 | - | 1 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 2 | 2 | - | - | - | - | 2 | - | 2 | 3 | 2 |
| **CO3** | 3 | 3 | 3 | 2 | 3 | - | - | - | - | 2 | - | 2 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 2 | 3 | - | - | - | - | 2 | - | 2 | 3 | 3 |
| **CO5** | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & V** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS503 - Compiler Design** |

**COURSE OUTCOMES (COs)**

| On completion of the course, the students will be able to | | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Understand the techniques in different phases of a compiler and Design a lexical analyser for a sample language and learn to use the LEX tool | Understanding (K2) |
| **CO2** | Apply different parsing algorithms to develop a parser and learn to use YACC tool | Applying (K3) |
| **CO3** | Understand semantics rules (SDT), intermediate code generation and run-time environment. | Understanding (K2) |
| **CO4** | Implement code optimization techniques. | Implement (K4) |
| **CO5** | Implement code generation techniques. | Implement (K4) |

**CO-PO MATRICES**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 1 | 3 | - | 3 | 2 | - |
| **CO2** | 3 | 3 | 2 | 2 | 3 | - | 3 | 3 | - |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | 3 | 3 | - |
| **CO4** | 2 | 2 | 3 | 2 | 3 | - | 3 | 3 | - |
| **CO5** | 2 | 2 | 3 | 2 | 3 | - | 2 | 3 | - |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & V** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23PIT05 - Software Testing and Automation** |

**COURSE OUTCOMES (COs)**

| On completion of the course, the students will be able to | | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Understand the basic concepts of software testing and the need for software testing | Understanding (K2) |
| **CO2** | Design Test planning and different activities involved in test planning | Create (K6) |
| **CO3** | Design effective test cases that can uncover critical defects in the application | Create (K6) |
| **CO4** | Carry out advanced types of testing | Applying (K3) |
| **CO5** | Automate the software testing using Selenium and Testing | Applying (K3) |

**CO-PO MATRICES**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 1 | 2 | - | - | - | 1 | 1 | 3 | 2 | 3 | 2 | 3 |
| **CO2** | 2 | 3 | 1 | 1 | 1 | - | - | - | 2 | 2 | 1 | 2 | 1 | 2 | 3 |
| **CO3** | 2 | 2 | 1 | 3 | 1 | - | - | - | 1 | 3 | 1 | 2 | 2 | 3 | 2 |
| **CO4** | 2 | 1 | 3 | 2 | 1 | - | - | - | 1 | 1 | 1 | 2 | 3 | 1 | 2 |
| **CO5** | 2 | 2 | 1 | 3 | 1 | - | - | - | 1 | 3 | 2 | 1 | 2 | 1 | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & V** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS905 - Cloud Computing** |

**COURSE OUTCOMES (COs)**

| | On completion of the course, the students will be able to | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Understand the design challenges in the cloud. | Understanding (K2) |
| **CO2** | Apply the concept of virtualization and its types. | Applying (K3) |
| **CO3** | Experiment with virtualization of hardware resources and Docker. | Applying (K3) |
| **CO4** | Develop and deploy services on the cloud and set up a cloud environment. | Applying (K3) |
| **CO5** | Explain security challenges in the cloud environment. | Understanding (K2) |

**CO-PO MATRICES**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 1 | 1 | - | - | - | 2 | 3 | 1 | 3 | 2 | 2 | 1 |
| **CO2** | 3 | 1 | 2 | 2 | 1 | - | - | - | 1 | 2 | 1 | 3 | 3 | 2 | 2 |
| **CO3** | 2 | 3 | 2 | 3 | 1 | - | - | - | 3 | 1 | 1 | 3 | 2 | 3 | 2 |
| **CO4** | 1 | 2 | 3 | 3 | 3 | - | - | - | 3 | 3 | 1 | 2 | 2 | 3 | 2 |
| **CO5** | 2 | 3 | 3 | 1 | 3 | - | - | - | 2 | 2 | 1 | 2 | 3 | 2 | 2 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & VI** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS601-Cryptography and Cyber Security** |

**COURSE OUTCOMES (COs)**

| On completion of the course, the students will be able to | | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Understand security goals, concepts of classical cryptography, cryptanalysis techniques, and steganography. | Understanding (K2) |
| **CO2** | Apply symmetric and asymmetric cryptographic algorithms (AES, DES, RSA, ECC) and key management techniques. | Applying (K3) |
| **CO3** | Apply hashing, MAC, digital signatures, and authentication protocols to ensure integrity and authenticity. | Applying (K3) |
| **CO4** | Understand cyber security fundamentals, cybercrime classifications, and legal aspects related to the Indian IT Act. | Understanding (K2) |
| **CO5** | Analyze categories, motivations, and tools used in cybercrimes and recommend basic security measures. | Analyzing(K4) |

**CO-PO MATRICES**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 1 | 1 | – | – | – | – | – | – | – | 1 | 1 | – | – |
| **CO2** | 3 | 3 | 2 | 2 | 3 | – | – | – | – | – | 1 | 1 | 2 | 1 | – |
| **CO3** | 2 | 2 | 2 | 2 | 3 | 1 | – | 2 | – | 1 | – | 1 | 1 | 1 | 1 |
| **CO4** | 1 | 1 | – | – | – | 3 | 1 | 2 | – | 1 | – | 1 | – | – | – |
| **CO5** | 1 | 2 | 2 | 1 | 2 | 3 | 1 | 1 | – | 1 | – | 2 | 1 | 2 | 1 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & VI** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS602-Internet Programming** |

**COURSE OUTCOMES (COs)**

| On completion of the course, the students will be able to | | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Develop basic responsive web pages using HTML, CSS, and JavaScript. | Apply(K3) |
| **CO2** | Design and implement RESTful APIs using Python Flask. | Apply(K3) |
| **CO3** | Create simple React applications using JSX and functional components. | Apply(K3) |
| **CO4** | Apply props, state, and event handling to build dynamic React components. | Apply(K3) |
| **CO5** | Implement database connectivity and perform CRUD operations using SQL and NoSQL databases. | Apply(K3) |

**CO-PO MATRICES**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | – | 3 | – | – | – | 2 | 2 | – | 1 | 3 | 2 | – |
| **CO2** | 3 | 3 | 3 | 1 | 3 | – | – | – | 2 | 2 | – | 1 | 3 | 3 | – |
| **CO3** | 3 | 2 | 3 | – | 3 | – | – | – | 2 | 3 | – | 1 | 3 | 3 | – |
| **CO4** | 3 | 2 | 3 | – | 3 | – | – | – | 2 | 3 | – | 1 | 3 | 3 | – |
| **CO5** | 3 | 3 | 3 | 1 | 3 | – | – | – | 2 | 2 | 1 | 1 | 3 | 3 | – |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & VI** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS903 Embedded Systems And IOT** |

## COURSE OUTCOMES (COs)

| On completion of the course, the students will be able to | | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Explainthearchitectureandfeaturesof8051. | Understand (K2) |
| **CO2** | ApplyARMprocessorarchitectureandprogrammingconcepts. | Apply (K3) |
| **CO3** | DevelopArduino-basedIoTapplicationsusingsensors,actuators,and communication interfaces | Apply (K3) |
| **CO4** | UseIoTcommunicationprotocolswithRaspberryPifordevice connectivity and cloud integration. | Apply (K3) |
| **CO5** | Designandevaluate real-timeembeddedand IoT-based solutionsfor smartagriculture,healthcare,smartcities,andindustrialautomation. | Analyze (K4) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | 2 | 2 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | 2 | 2 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | 2 | 2 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | 2 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | 2 | 2 | 3 | 3 | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & VI** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS611-Mini Project** |

## COURSE OUTCOMES (COs)

| | On completion of the course, the students will be able to | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Apply programming and logical problem-solving skills to develop a simple and functional software/application. | Apply (K3) |
| **CO2** | Identify and clearly define a real-world problem, analyze its needs, and propose suitable technical solutions. | Analyze (K4) |
| **CO3** | Design and build a small-scale model or system using appropriate tools, programming languages, and technologies. | Analyze (K4) |
| **CO4** | Gain practical skills in gathering information (literature survey), planning requirements, writing code, testing, and debugging | Apply (K3) |
| **CO5** | Develop teamwork, communication, documentation, and presentation abilities while managing the project within the given timeline. | Apply (K3) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | - |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | - |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | - |
| **CO4** | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | - |
| **CO5** | - | - | - | - | - | - | - | 3 | 3 | 3 | 3 | 3 | - | 3 | 2 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & VII** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23GE902 - Human Values and Ethics** |

## COURSE OUTCOMES (COs)

| | On completion of the course, the students will be able to | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Explain how democratic values like equality, liberty, and justice enhance governance and citizen participation. | Understand ( K2) |
| **CO2** | Apply secular values to ensure acceptance of all faiths and non-discrimination. | Apply (K3) |
| **CO3** | Apply scientific thinking and methods to assess and promote transparency, fairness, and ethical use of scientific inventions for societal benefit. | Apply (K3) |
| **CO4** | Explain how ethical reasoning applies to social issues and constitutional protections. | Understand (K2) |
| **CO5** | Apply professional ethics to address issues such as honesty, confidentiality, and conflicts of interest in the workplace. | Apply (K3) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | - | 1 | 2 | 3 | 1 | 2 | - | 2 | - | - | - |
| **CO2** | - | - | - | - | - | 1 | 2 | 3 | 1 | 2 | - | 2 | - | - | - |
| **CO3** | - | - | - | - | - | 1 | 2 | 3 | 1 | 2 | - | 2 | - | - | - |
| **CO4** | - | - | - | - | - | 1 | 2 | 3 | 1 | 2 | - | 2 | - | - | - |
| **CO5** | - | - | - | - | - | 1 | 2 | 3 | 1 | 2 | - | 3 | - | - | - |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & VI** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23AD701 - Big Data Analytics** |

## COURSE OUTCOMES (COs)

| | On completion of the course, the students will be able to | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Understand the evolution and components of Big Data platforms, including modern applications. | Understand (K2) |
| **CO2** | Compare and apply NoSQL databases and schema design strategies. | Understand (K2) |
| **CO3** | Develop and test data processing jobs using MapReduce and Spark. | Apply (K3) |
| **CO4** | Manage data storage using HDFS and modern file systems | Apply (K3) |
| **CO5** | Use tools like HBase, Hive, Pig, Flink, and NiFi for scalable data analytics and processing. | Analyze (K4) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 2 | - | - | 1 | - | - | - | - | 2 | - | - | 3 |
| **CO2** | 3 | 3 | - | 2 | - | - | - | - | - | - | - | 3 | - | - | 3 |
| **CO3** | 2 | 3 | - | 3 | - | - | - | - | - | - | - | 3 | - | - | 2 |
| **CO4** | 2 | 2 | - | 3 | - | - | - | - | - | - | - | 2 | - | - | 2 |
| **CO5** | 2 | 3 | - | 3 | - | - | - | - | - | - | - | 3 | - | - | 2 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & VI** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23PAD06-Recommende Systems** |

## COURSE OUTCOMES (COs)

| | On completion of the course, the students will be able to | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Identify various types of recommender systems and the challenges in designing them. | Understand (K2) |
| **CO2** | Applysimilaritymetricstoimplementcollaborativeandcontent-basedfiltering | Apply (K3) |
| **CO3** | Analyzeandevaluatematrixfactorizationand hybridmethods. | Apply (K3) |
| **CO4** | Designandimplementarecommendermodelwithreal-worlddatasets. | Apply (K3) |
| **CO5** | Assessrecommendationqualityusingsuitableevaluationmetrics. | Analyze (K4) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | 1 | - | 2 | 2 | - | 3 |
| **CO2** | 3 | 3 | 2 | 2 | 3 | - | - | - | - | 2 | - | 2 | 3 | 2 | 3 |
| **CO3** | 3 | 2 | 3 | 2 | 3 | - | - | - | - | 2 | - | 2 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | - | - | - | 1 | 2 | 1 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 2 | - | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & VI** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23PCS13- Network Security** |

**COURSE OUTCOMES (COs)**

| On completion of the course, the students will be able to | | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Describesecurityconcepts,services,andmechanisms. | Understand(K2) |
| **CO2** | Understandsymmetricandasymmetricencryptiontechniques. | Understand(K2) |
| **CO3** | Analyzeauthenticationandkeymanagement protocols. | Apply(K3) |
| **CO4** | Illustratesecurecommunicationpracticesinnetworksandtheweb. | Apply(K3) |
| **CO5** | Analyzecryptographictechniquesinsimulatedenvironments. | Analyze(K4) |

**CO-PO MATRICES**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | - | 2 | - | - | - | - | - | - | - | 2 | - | - | 3 |
| **CO2** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | - | - | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | 3 | 2 | - | 3 |
| **CO4** | 3 | 3 | 2 | | 2 | - | - | - | - | - | - | 3 | 2 | - | 3 |
| **CO5** | 3 | 3 | | 2 | 3 | - | - | - | - | - | - | 3 | 3 | 2 | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & VI** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23OME04-Foundation of Roboticss** |

## COURSE OUTCOMES (COs)

| | On completion of the course, the students will be able to | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Interpretthefeaturesofrobotsand technologyinvolvedinthecontrol. | Understand (K2) |
| **CO2** | Applythebasicengineeringknowledgeandlawsforthedesignof robotics. | Apply (K3) |
| **CO3** | Explain thebasic concepts likevarious configurations, classification and parts of endeffectorscomparevarious endeffectorsandgrippersandtoolsandsensors usedin robots. | Understand (K2) |
| **CO4** | Explaintheconceptofkinematics,degeneracy,dexterityandtrajectory planning. | Understand (K2) |
| **CO5** | Demonstrate the image processing and image analysis techniques by machine vision | Apply (K3) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | - | - |
| **CO2** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | - | - |
| **CO3** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | - | - |
| **CO4** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | - | - |
| **CO5** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | - | - |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & VI** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS711-Summer internship II** |

## COURSE OUTCOMES (COs)

| | On completion of the course, the students will be able to | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Gain hands-on industrial exposure and understand real-world engineering practices. | Apply (K3) |
| **CO2** | Apply engineering concepts and tools in a professional work environment. | Apply (K3) |
| **CO3** | Understand organizational structure, work ethics, and professional responsibilities. | Understand (K2) |
| **CO4** | Improve technical, communication, and interpersonal skills through workplace interaction. | Apply (K3) |
| **CO5** | Develop awareness of industry challenges, emerging technologies, and career pathways. | Apply (K3) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | - |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | - |
| **CO3** | - | - | - | - | - | - | - | 3 | 3 | 3 | 2 | 2 | - | - | - |
| **CO4** | - | - | - | - | - | - | - | 3 | 3 | 3 | 2 | 2 | - | - | - |
| **CO5** | - | - | - | - | - | - | - | 3 | 3 | 3 | 3 | 3 | 3 | - | - |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **III & VI** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS712 Research Paper Writing and Publications** |

## COURSE OUTCOMES (COs)

| | On completion of the course, the students will be able to | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Identify research problems and conduct literature review. | Understand (K2) |
| **CO2** | Prepare plagiarism-free academic documents. | Apply (K3) |
| **CO3** | Write structured research papers following academic standards. | Create (K6) |
| **CO4** | Use digital tools for citation, formatting, and quality improvement. | Apply (K3) |
| **CO5** | Submit papers to journals or conferences with proper documentation. | Create (K6) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | – | – | 1 | – | – | – | 1 | – | 1 | 2 | 1 | 1 | - |
| **CO2** | 3 | 2 | 1 | 1 | 3 | – | – | – | – | 1 | 2 | 3 | 2 | 1 | - |
| **CO3** | 3 | 3 | 2 | 2 | 3 | – | – | – | – | – | 1 | 3 | 2 | 1 | - |
| **CO4** | 2 | 2 | 3 | – | 2 | – | – | 1 | 2 | 1 | 2 | 2 | 2 | 1 | - |
| **CO5** | 3 | 3 | 3 | 2 | 3 | – | – | 2 | 2 | 2 | 2 | 3 | 3 | 2 | - |

**Mapping: 1-Low, 2-Medium, 3-High**

| | |
|---|---|
| **Year & Sem:** | **IV & VIII** |
| **Regulation** | **R23 – NPR Autonomous** |
| **Course Code & Title:** | **23CS811 - Project Work** |

## COURSE OUTCOMES (COs)

| | On completion of the course, the students will be able to | Bloom's Level Mapped |
|---|---|---|
| **CO1** | Gain domain knowledge and technical skill set required for solving industry / research problems | Apply (K3) |
| **CO2** | Design and implement a **system, model, prototype, or software relevant** to the chosen project. | Apply (K3) |
| **CO3** | Provide solution architecture, module-level designs, and implement algorithms to address the problem | Analyze (K4) |
| **CO4** | Implement, test, and deploy the solution on the target platform ensuring functionality and reliability. | Apply (K3) |
| **CO5** | Apply teamwork, project management, and communication skills to execute, document, and present a complete solution. | Apply (K3) |

## CO-PO MATRICES

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | - |
| **CO2** | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - |
| **CO3** | - | 3 | 3 | 2 | 2 | - | - | 3 | 3 | 3 | 2 | 2 | 3 | 3 | - |
| **CO4** | - | 2 | 2 | 2 | 3 | - | - | 3 | 3 | 3 | - | - | 2 | 3 | - |
| **CO5** | - | - | - | - | - | - | - | 3 | 3 | 3 | 3 | 3 | - | 2 | 3 |

**Mapping: 1-Low, 2-Medium, 3-High**