# Course Outcomes & Course Articulation Matrix

**ACADEMIC YEAR: 2025-26**

**Course Outcomes:**

| **Semester No:** | IV | | |
|---|---|---|---|
| **Course Title:** | **Design and Analysis of Algorithms** | **Course Code:** | **(U24CS401** |
| **Course Outcome No.** | **Description** | | |
| **DAA.CO1** | Demonstrate the use of Asymptotic notations to find the efficiency of Algorithms. | | |
| **DAA.CO2** | Apply Divide-and-Conquer, Transform-and-Conquer and Decrease and Conquer to Solve Real World Problem. | | |
| **DAA.CO3** | Apply Greedy Approach problem solving Techniques to solve real world problems. | | |
| **DAA.CO4** | Apply Dynamic Programming problem solving Techniques to solve real world problems. | | |
| **DAA.CO5** | Apply and Analyze Backtracking and Branch and Bound approaches for solving real world problems and Distinguish P and NP Problems | | |
| **DAA.CO1** | Demonstrate the use of Asymptotic notations to find the efficiency of Algorithms. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **DAA.CO1** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | 2 | 2 |
| **DAA.CO2** | 2 | 2 | 2 | 3 | 3 | - | - | - | - | - | 2 | 3 | 3 |
| **DAA.CO3** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | 2 | 3 | 3 |
| **DAA.CO4** | 3 | 2 | 3 | 3 | 3 | - | - | - | - | - | 2 | 3 | 2 |
| **DAA.CO5** | 3 | 3 | 2 | 2 | 3 | - | - | - | - | - | 2 | 3 | 3 |
| **DAA** | **2.8** | **2.8** | **2.6** | **2.8** | **3** | **-** | **-** | **-** | **-** | **-** | **2.4** | **2.8** | **2.6** |

**Course Outcomes:**

| **Semester No:** | IV | | |
|---|---|---|---|
| **Course Title:** | **Operations Research** | **Course Code:** | **(U24ME404)** |
| **Course Outcome No.** | **Description** | | |
| **OR.CO1** | Formulate and solve linear programming problems using graphical, simplex, and special-case methods (unbounded, infeasible, degeneracy) to support optimal decision-making. | | |
| **OR.CO2** | Apply transportation and assignment algorithms (NWC, LCM, VAM, MODI, Hungarian method, TSP variations) to obtain optimal resource allocation solutions. | | |
| **OR.CO3** | Develop project schedules using CPM and PERT by determining earliest/latest event times, critical path, crashing, and resource allocation for effective project management. | | |
| **OR.CO4** | Analyze replacement situations using economic models (with and without time value of money) and evaluate optimal policies for deteriorating and failure-prone items. | | |
| **OR.CO5** | Apply Game Theory techniques—including maximin–minimax, dominance, mixed strategy, and graphical methods—to determine optimal strategies for competitive scenarios | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **OR.CO1** | 3 | 3 | 2 | 2 | 1 | – | – | – | – | – | – | 3 | 3 |
| **OR.CO2** | 3 | 3 | 2 | 2 | 1 | – | – | – | – | – | – | 3 | 3 |
| **OR.CO3** | 2 | 3 | 2 | 2 | 1 | – | – | – | – | – | 3 | 3 | 3 |
| **OR.CO4** | 2 | 3 | 1 | 2 | – | – | – | – | – | – | – | 3 | 3 |
| **OR.CO5** | 2 | 3 | 1 | 2 | – | – | – | – | – | – | – | 3 | 3 |
| **OR.CO6** | 2 | 3 | 1 | 2 | 3 | – | – | – | – | – | - | 3 | 3 |
| **Avg** | **2.3** | **3** | **1.5** | **2** | **1.5** | **-** | **-** | **-** | **-** | **-** | **3** | **3** | **3** |

**Course Outcomes:**

| **Semester No:** | IV | | |
|---|---|---|---|
| **Course Title:** | **Database Management System** | **Course Code:** | **(U24IT401)** |
| **Course Outcome No.** | **Description** | | |
| **DBMS.CO1** | Explain purpose of data and data models, and apply SQL commands with joins, views, Integrity Constraints and security. | | |
| **DBMS.CO2** | Analyze relational algebra operations and translate queries into algebraic and calculus expressions. | | |
| **DBMS.CO3** | Differentiate SQL and NoSQL systems and evaluate schemas using functional dependencies and normal forms. | | |
| **DBMS.CO4** | Analyze the various transaction states and evaluate the mechanisms for controlling concurrency and recovering from failures to ensure consistency. | | |
| **DBMS.CO.5** | Classify storage and file organizations and compare indexing and hashing methods for efficient retrieval. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **DBMS.CO1** | 3 | 2 | 2 | 2 | 3 | – | - | – | - | – | 3 | 3 | 3 |
| **DBMS.CO2** | 3 | 3 | – | - | – | – | – | – | – | – | - | 3 | 2 |
| **DBMS.CO3** | 3 | 3 | 2 | 3 | 2 | – | – | – | – | – | 2 | 3 | 3 |
| **DBMS.CO4** | 3 | 3 | 2 | 2 | – | – | – | – | – | – | - | 2 | 2 |
| **DBMS.CO5** | 3 | 3 | 2 | - | - | – | – | – | – | – | - | 2 | 2 |
| **DBMS** | **3.0** | **2.8** | **2.0** | **2.3** | **2.5** | **-** | **-** | **-** | **-** | **-** | **2.5** | **2.6** | **2.4** |

**Course Outcomes:**

| **Semester No:** | IV | | |
|---|---|---|---|
| **Course Title:** | **Operating Systems** | **Course Code:** | **(U24CD401)** |
| **Course Outcome No.** | **Description** | | |
| **OS.CO1** | Recall the functions of operating systems | | |
| **OS.CO2** | Apply CPU scheduling algorithms and Deadlock algorithms. | | |
| **OS.CO3** | Apply memory management strategies. | | |
| **OS.CO4** | Analyze various file management strategies in different operating system. | | |
| **OS.CO5** | Analyze protection and security levels in domains and implement security defences. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **OS.CO1** | 3 | 2 | 2 | 1 | 1 | - | - | - | 1 | - | 2 | 2 | 2 |
| **OS.CO2** | 3 | 3 | 2 | 2 | 2 | - | - | - | 1 | - | 2 | 3 | 2 |
| **OS.CO3** | 3 | 3 | 2 | 2 | 2 | - | - | - | 1 | - | 2 | 3 | 2 |
| **OS.CO4** | 3 | 3 | 2 | 2 | 2 | - | - | - | 1 | - | 2 | 3 | 2 |
| **OS.CO5** | 3 | 3 | 2 | 2 | 2 | - | - | - | 1 | - | 2 | 3 | 2 |
| **OS.** | **3.0** | **2.8** | **2.0** | **1.8** | **1.8** | **-** | **-** | **-** | **1.0** | **-** | **2.0** | **2.8** | **2.0** |

**Course Outcomes:**

| **Semester No:** | IV | | |
|---|---|---|---|
| **Course Title:** | **Java Programming** | **Course Code:** | **(U24IT402)** |
| **Course Outcome No.** | **Description** | | |
| **JP.CO1** | Summarize OOP concepts and basics of java programming. | | |
| **JP.CO2** | Apply the concept of interfaces and inheritance to solve the real world problems. | | |
| **JP.CO3** | Choose a suitable package to develop the inter process communication using multithreading. | | |
| **JP.CO4** | Categorize GUI applications using AWT by analyzing Event handler classes. | | |
| **JP.CO5** | Develop application using JDBC connectivity perform CURD operations. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **JP.CO1** | 3 | 2 | 2 | 1 | 3 | - | - | 1 | 1 | 1 | 1 | 3 | 3 |
| **JP.CO2** | 3 | 3 | 2 | 1 | 3 | - | - | 1 | 1 | 1 | 2 | 3 | 2 |
| **JP.CO3** | 2 | 3 | 1 | 3 | 2 | - | - | 1 | 2 | 2 | 2 | 2 | 3 |
| **JP.CO4** | 3 | 3 | 3 | 1 | 3 | - | - | 1 | 2 | 2 | 3 | 3 | 3 |
| **JP.CO5** | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 |
| **JP** | **2.8** | **2.8** | **2.2** | **1.8** | **2.8** | **1** | **1** | **1.0** | **1.6** | **1.6** | **2.2** | **2.8** | **2.8** |

**Course Outcomes:**

| **Semester No:** | IV | | |
|---|---|---|---|
| **Course Title:** | Database Management Systems Lab | **Course Code:** | **U24IT4L1** |
| **Course Outcome No.** | **Description** | | |
| **DBMS Lab.CO1** | Identify entities and relationships and draw basic E-R models for given scenarios. | | |
| **DBMS Lab.CO2** | Use SQL DDL and DML commands to create, update, and manage database tables. | | |
| **DBMS Lab.CO3** | Apply SQL queries including joins, subqueries, and aggregate functions to retrieve required information. | | |
| **DBMS Lab.CO4** | Use PL/SQL techniques to write stored procedures, and triggers that support and manage database operations. | | |
| **DBMS Lab.CO5** | Analyze case-based problems and construct normalized relational schemas and basic data models. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **DBMS Lab.CO1** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 |
| **DBMS Lab.CO2** | 3 | 3 | 3 | - | 2 | - | - | - | - | - | - | 3 | 2 |
| **DBMS Lab.CO3** | 3 | 3 | 2 | - | 2 | - | - | - | - | - | - | 3 | 3 |
| **DBMS Lab.CO4** | 3 | 2 | 3 | - | 3 | - | - | - | - | - | 2 | 2 | 2 |
| **DBMS Lab.CO5** | - | 3 | 3 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| **DBMS Lab** | **3.0** | **2.8** | **2.6** | **2.0** | **2.3** | **-** | **-** | **-** | **-** | **-** | **2.0** | **2.6** | **2.4** |

**Course Outcomes:**

| **Semester No:** | IV | | |
|---|---|---|---|
| **Course Title:** | Operating System Lab | **Course Code:** | **U24CD4L1** |
| **Course Outcome No.** | **Description** | | |
| **OS LAB.CO1** | Demonstrate the execution of UNIX commands and shell programming. | | |
| **OS LAB.CO2** | Analyze the various system calls | | |
| **OS LAB.CO3** | Implementing CPU scheduling Algorithms. | | |
| **OS LAB .CO4** | Apply memory management techniques and implement CPU scheduling algorithms. | | |
| **OS LAB.CO5** | Implementing deadlock handling mechanisms. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **DBMS Lab.CO1** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 |
| **DBMS Lab.CO2** | 3 | 3 | 3 | - | 2 | - | - | - | - | - | - | 3 | 2 |
| **DBMS Lab.CO3** | 3 | 3 | 2 | - | 2 | - | - | - | - | - | - | 3 | 3 |
| **DBMS Lab.CO4** | 3 | 2 | 3 | - | 3 | - | - | - | - | - | 2 | 2 | 2 |
| **DBMS Lab.CO5** | - | 3 | 3 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| **DBMS Lab** | **3.0** | **2.8** | **2.6** | **2.0** | **2.3** | **-** | **-** | **-** | **-** | **-** | **2.0** | **2.6** | **2.4** |

**Course Outcomes:**

| **Semester No:** | IV | | |
|---|---|---|---|
| **Course Title:** | Java Programming Lab | **Course Code:** | **U24IT4L2** |
| **Course Outcome No.** | **Description** | | |
| **JP Lab.CO1** | Apply Inheritance, Interfaces, packages, access control specifiers to develop Java Applications. | | |
| **JP Lab.CO2** | Implement the concepts of Exception Handling in Java Applications. | | |
| **JP Lab.CO3** | Analyze the Read and Write data using different Java I/O Streams. | | |
| **JP Lab.CO4** | Develop graphical user interfaces and Applets by applying the knowledge of Event Handling. | | |
| **JP Lab.CO5** | Develop Robust applications using java standard class libraries and retrieve data from a database with JDBC. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **JP Lab.CO1** | 3 | 2 | 2 | 1 | 3 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 2 |
| **JP Lab.CO2** | 2 | 3 | 2 | 2 | 2 | 1 | - | 1 | 2 | 1 | 2 | 2 | 3 |
| **JP Lab.CO3** | 2 | 2 | 2 | 1 | 3 | 1 | - | 1 | 2 | 1 | 2 | 3 | 3 |
| **JP Lab.CO4** | 2 | 2 | 3 | 1 | 2 | 1 | - | 2 | 3 | 1 | 2 | 3 | 2 |
| **JP Lab.CO5** | 3 | 3 | 3 | 2 | 3 | 1 | - | 2 | 3 | 2 | 3 | 3 | 3 |
| **JP Lab** | **2.4** | **2.4** | **2.4** | **1.4** | **2.6** | **1** | **1** | **1.4** | **2.4** | **1.2** | **2.2** | **2.8** | **2.6** |

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**Department of Information Technology**

# Course Outcomes & Course Articulation Matrix

**ACADEMIC YEAR: 2025-26**

**Course Outcomes:**

| **Semester No:** | **VI** | | |
|---|---|---|---|
| **Course Title:** | **Embedded Systems & Internet of Things** | **Course Code:** | **U23IT601** |
| **Course Outcome No.** | **Description** | | |
| **ESIoT.CO1** | State the Internal architecture and programming of an embedded processor. | | |
| **ESIoT.CO2** | Interface I/O devices to the processor. | | |
| **ESIoT.CO3** | Present the Internet of Things (IOT) progress. | | |
| **ESIoT.CO4** | Use the Arduino, Raspberry Pi, and open platform , to construct a small, inexpensive embedded and Internet of Things system. | | |
| **ESIoT.CO5** | Compute the Internet of Things concept in a practical setting. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **ESIoT.CO1** | **3** | **2** | **2** | | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **3** | **1** |
| **ESIoT.CO2** | **3** | **3** | **2** | **2** | **2** | **-** | **-** | **-** | **1** | **-** | **-** | **2** | **3** |
| **ESIoT.CO3** | **2** | **-** | **-** | | **2** | **2** | **2** | **2** | **-** | **2** | **-** | **1** | **2** |
| **ESIoT.CO4** | **2** | **2** | **3** | **2** | **3** | **2** | **-** | | **2** | **2** | **2** | **1** | **3** |
| **ESIoT.CO5** | **2** | **3** | **3** | **2** | **2** | **2** | **2** | **2** | **2** | **-** | **-** | **1** | **2** |
| **Avg.** | **2.4** | **2.5** | **2.5** | **2** | **2.2** | **2** | **2** | **2** | **1.6** | **2** | **1** | **1.6** | **2.2** |

**Course Outcomes:**

| **Semester No:** | **VI** | | |
|---|---|---|---|
| **Course Title:** | **Computer Networks** | **Course Code:** | **U23CD602** |
| **Course Outcome No.** | **Description** | | |
| **CN.1** | Describe and interpret standard reference models such as OSI and TCP/IP, and distinguish between various network architectures. | | |
| **CN.2** | Recognize and list the roles of essential network devices and multiple access protocols used in data communication | | |
| **CN.3** | Design IP addressing schemes and apply routing techniques to interconnect and manage heterogeneous network systems | | |
| **CN.4** | Explain the principles, features, and operational differences of transport layer protocols including TCP and UDP | | |
| **CN.5** | Formulate application layer protocols such as HTTP, DNS, SMTP, and FTP in practical networking environments. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **CN.1** | 3 | 1 | - | - | 1 | - | - | - | - | - | 1 | 3 | - |
| **CN.2** | 2 | 1 | - | - | 3 | - | - | - | - | - | 1 | 3 | - |
| **CN.3** | 3 | 3 | 3 | - | 2 | - | - | - | - | - | 1 | 3 | 3 |
| **CN.4** | 1 | 3 | - | - | 1 | - | - | - | - | - | 1 | 3 | - |
| **CN.5** | 1 | 1 | 3 | - | 2 | - | - | - | - | - | 2 | 3 | 3 |
| **CN** | **2** | **1.8** | **3** | **-** | **1.8** | **-** | **-** | **-** | **-** | **-** | **1.2** | **3** | **3** |

**Course Outcomes:**

| **Semester No:** | **VI** | | |
|---|---|---|---|
| **Course Title:** | **Machine Learning** | **Course Code:** | **U23CM602** |
| **Course Outcome No.** | **Description** | | |
| **ML.CO1** | Explain the concept of machine learning and its types | | |
| **ML.CO2** | Apply descriptive statistical measures to analyse and summarize datasets | | |
| **ML.CO3** | Apply regression techniques to build prediction models | | |
| **ML.CO4** | Analyse classification problems using probabilistic models and interpret metrices. | | |
| **ML.CO5** | Apply non-parametric, ensemble, and instance-based ML algorithms for real-world problems | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **ML.CO1** | 3 | 2 | 1 | - | 1 | - | – | – | – | – | 2 | 2 | 1 |
| **ML.CO2** | 3 | 3 | - | 2 | 2 | – | – | 1 | – | – | 1 | 3 | 2 |
| **ML.CO3** | 3 | 3 | 2 | 2 | 3 | - | – | 1 | – | – | 1 | 3 | 3 |
| **ML.CO4** | 3 | 3 | 2 | 3 | 3 | - | – | 1 | - | - | 1 | 3 | 3 |
| **ML.CO5** | 3 | 3 | 3 | 2 | 3 | 1 | – | 2 | - | - | 2 | 3 | 3 |
| **AVG** | **3.0** | **2.8** | **2.0** | **2.2** | **2.4** | **1.0** | **0.0** | **1.2** | **0.0** | **0.0** | **1.4** | **2.8** | **2.4** |

**Course Outcomes:**

| Semester No: | VI | | |
|---|---|---|---|
| Course Title: | Software Engineering | Course Code: | U23IT606 |
| Course Outcome No. | Description | | |
| SE.CO1 | Demonstrate knowledge of processes models and usability in problem specific domains. | | |
| SE.CO2 | Implement various modeling techniques for elicitation and design techniques to perform architectural analysis for requirements of stakeholders. | | |
| SE.CO3 | Assess and work on software quality and metrics by implementing the risk mitigation. | | |
| SE.CO4 | Implement software testing techniques and strategies for software validation. | | |
| SE.CO5 | Express software configuration and management practices using product metrics and estimation techniques using CMM. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| Course Outcomes (CO's) | Program Outcomes (PO) | | | | | | | | | | | Program Specific Outcomes (PSO's) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| SE.CO1 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | 2 |
| SE.CO2 | 2 | 3 | 3 | 2 | - | - | - | - | - | - | - | 3 | 3 |
| SE.CO3 | 2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | 3 | 3 |
| SE.CO4 | 2 | 2 | 3 | 3 | 2 | - | - | - | - | - | - | 3 | 2 |
| SE.CO5 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 |
| **Average** | **2.4** | **2.4** | **2.6** | **2.5** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **2.8** | **2.6** |

**Course Outcomes:**

| Semester No: | VI | | |
|---|---|---|---|
| Course Title: | Road Safety Engineering | Course Code: | U23CE608 |
| Course Outcome No. | Description | | |
| RSE.CO1 | Understand the fundamentals of traffic safety analysis | | |
| RSE.CO2 | Analyze Accident Data | | |
| RSE.CO3 | Remember the concepts of Road Safety in Urban transport | | |
| RSE.CO4 | Apply Crash Reduction Techniques | | |
| RSE.CO5 | Design of Urban Infrastructure considering Safety Aspects | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| Course Outcomes (CO's) | Program Outcomes (PO) | | | | | | | | | | | Program Specific Outcomes (PSO's) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| RSE.CO1 | 3 | | | | | 2 | 1 | 2 | | | | 2 | 3 |
| RSE.CO2 | 3 | | | | | 2 | 1 | 2 | | | | 2 | |
| RSE.CO3 | 3 | | | | | 2 | 1 | 2 | | | | 2 | |
| RSE.CO4 | 3 | | | | | 2 | 1 | | | | | 2 | |
| RSE.CO5 | 3 | | | | | 2 | 1 | | | | | 2 | |
| **RSE Avg. CO** | **3** | | | | | **2** | **1** | **1.2** | | | | **2** | **0.6** |

**Course Outcomes:**

| Semester No: | VI | | |
|---|---|---|---|
| Course Title: | Embedded Systems and Internet of Things Lab | Course Code: | U21IT6L1 |
| **Course Outcome No.** | **Description** | | |
| **ESIoT.CO1** | Possess the passion for acquiring programming skills in using different tools. | | |
| **ESIoT.CO2** | Able to design and develop embedded systems (hardware, peripherals and firmware). | | |
| **ESIoT.CO3** | Write code for different forms of interfacing devices | | |
| **ESIoT.CO4** | Develop python programs that run on Raspberry Pi4. | | |
| **ESIoT.CO5** | Interface Sensors and Actuators with Raspberry Pi4. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| Course Outcomes (CO's) | Program Outcomes (PO) | | | | | | | | | | | Program Specific Outcomes (PSO's) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| ESIoT.CO1 | 2 | 1 | - | - | 3 | - | - | - | 1 | 1 | - | 2 | 1 |
| ESIoT.CO2 | 2 | 3 | 3 | 2 | 2 | - | - | 1 | 2 | 1 | 1 | 3 | 2 |
| ESIoT.CO3 | 2 | 2 | - | 2 | 3 | - | - | - | 1 | 1 | - | 3 | 2 |
| ESIoT.CO4 | 2 | 1 | 2 | - | 3 | - | - | - | 1 | 1 | - | 2 | 3 |
| ESIoT.CO5 | 2 | 2 | 3 | 2 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 3 |
| Avg. | 2 | 1.8 | 2.6 | 2 | 2.8 | 1 | 1 | 1 | 1.4 | 1 | 1 | 2.4 | 2.2 |

**Course Outcomes:**

| **Semester No:** | **VI** | | |
|---|---|---|---|
| **Course Title:** | **Computer Networks Lab** | **Course Code:** | **U23CD6L2** |
| **Course Outcome No.** | **Description** | | |
| **CNLAB.1** | Explain basic networking concepts, devices, cables, WLAN, routers, and switches. | | |
| **CNLAB.2** | Implement a Local Area Network and configure IP addressing to test connectivity using ping and traceroute | | |
| **CNLAB.3** | Configure and verify IP addresses on router interfaces using Packet Tracer. | | |
| **CNLAB.4** | Analyze network protocols and topologies using simulation tools. | | |
| **CNLAB.5** | Design and configure VLANs and network services and analyze network connectivity. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **CN.1** | 3 | 1 | – | 2 | 1 | – | – | – | - | | – | 2 | – |
| **CN.2** | 2 | – | – | 1 | 3 | – | – | – | – | – | – | 1 | – |
| **CN.3** | 3 | 3 | 2 | 2 | – | – | – | – | – | – | – | – | 3 |
| **CN.4** | 1 | 3 | – | 3 | 1 | – | – | – | – | – | – | 2 | – |
| **CN.5** | – | – | 3 | – | 2 | – | – | – | – | – | – | 2 | 3 |
| **CN** | **2.2** | **2.3** | **2.5** | **2** | **1.7** | **-** | **-** | **-** | **-** | **-** | **-** | **1.7** | **3** |

**Course Outcomes:**

| Semester No: | VI | | |
|---|---|---|---|
| Course Title: | Machine Learning Lab | Course Code: | U23CM6L2 |
| Course Outcome No. | Description | | |
| ML Lab.CO1 | Apply Python programming concepts and NumPy operations for effective data handling and numerical computation. | | |
| ML Lab.CO2 | Perform data pre-processing techniques for machine learning applications. | | |
| ML Lab.CO3 | Apply regression techniques to solve prediction problems. | | |
| ML Lab.CO4 | Implement classification and clustering algorithms for data analysis. | | |
| ML Lab.CO5 | Evaluate machine learning models using performance metrics. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| Course Outcomes (CO's) | Program Outcomes (PO) | | | | | | | | | | | Program Specific Outcomes (PSO's) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| ML Lab.CO1 | 3 | 2 | - | - | 3 | – | – | – | - | | – | 2 | 2 |
| ML Lab.CO2 | 2 | 3 | - | 2 | 3 | – | – | – | – | – | – | 3 | 2 |
| ML Lab.CO3 | 3 | 3 | 2 | - | 3 | – | – | – | – | – | – | 3 | 3 |
| ML Lab.CO4 | 3 | 3 | 3 | - | 3 | – | – | – | – | – | – | 3 | 3 |
| ML Lab.CO5 | 2 | 3 | - | 3 | 3 | – | – | – | – | – | – | 3 | 3 |
| **ML Lab.CO** | **2.6** | **2.8** | **2.5** | **2.5** | **3.0** | **-** | **-** | **-** | **-** | **-** | **-** | **2.8** | **2.6** |

**Course Outcomes:**

| Semester No: | VI | | |
|---|---|---|---|
| Course Title: | Mini Project | Course Code: | U23IT6P1 |
| **Course Outcome No.** | **Description** | | |
| MINI.CO1 | Demonstrate fundamental and applied knowledge in the chosen domain to define the problem and scope of the mini project. | | |
| MINI.CO2 | Analyse, identify, and justify appropriate technical methods, tools, and technologies required for the selected project in a systematic manner | | |
| MINI.CO3 | Design, implement, and refine a technical solution by applying engineering principles to meet project objectives. | | |
| MINI.CO4 | Work effectively as an individual and as a team member by applying professional, ethical, and collaborative practices during project execution. | | |
| MINI.CO5 | Prepare and present technical documentation and project outcomes effectively through reports, presentations, and demonstrations. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| Course Outcomes (CO's) | Program Outcomes (PO) | | | | | | | | | | | Program Specific Outcomes (PSO's) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| MINI.CO1 | 3 | 2 | 2 | 2 | 2 | – | – | – | – | – | – | 2 | 2 |
| MINI.CO2 | 2 | 3 | 2 | 2 | 3 | – | – | – | – | – | – | 3 | 2 |
| MINI.CO3 | 2 | 2 | 3 | 3 | 3 | – | – | – | – | – | – | 3 | 3 |
| MINI.CO4 | – | – | 2 | – | – | 2 | – | 2 | 3 | 2 | 3 | 2 | 2 |
| MINI.CO5 | – | – | – | – | – | – | – | 2 | 2 | 3 | 2 | 2 | 2 |
| **MINI** | **2.3** | **2.3** | **2.3** | **2.3** | **2.7** | **2.0** | **–** | **2.0** | **2.5** | **2.5** | **2.5** | **2.4** | **2.2** |

# LORDS INSTITUTE OF ENGINEERING & TECHNOLOGY

**(UGC Autonomous)**

Approved by AICTE | Affiliated to Osmania University | Estd.2003.

**Department of Information Technology**

## Course Outcomes & Course Articulation Matrix

**ACADEMIC YEAR: 2025-26**

**Course Outcomes:**

| **Semester No:** | **VIII** | | |
|---|---|---|---|
| **Course Title:** | **Web Security** | **Course Code:** | **U21IT803** |
| **Course Outcome No.** | **Description** | | |
| **WS.CO1** | Identify and address fundamental security risks in web applications including strategies to mitigate vulnerabilities in user input handling | | |
| **WS.CO2** | Explain and manage robust authentication and error handling systems in web applications | | |
| **WS.CO3** | Assess and improve the security of session management systems by implementing encryption and mitigating token hijacking risks | | |
| **WS.CO4** | Analyze best practices to safeguard against XSS, CSRF, and injection attacks, demonstrating skill in detecting and mitigating web application threats | | |
| **WS.CO5** | Explain defensive software architectures and conduct vulnerability management to secure web applications against advanced threats | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **WS.CO1** | 2 | 2 | 2 | - | 2 | - | - | - | - | - | 3 | 3 | 2 |
| **WS.CO2** | 2 | 3 | 3 | - | 2 | 2 | - | - | 2 | - | 2 | 3 | 3 |
| **WS.CO3** | 2 | 2 | 2 | - | 2 | 2 | - | - | - | 2 | 3 | 3 | 2 |
| **WS.CO4** | 2 | 2 | 2 | 3 | 2 | 2 | - | - | 2 | - | 2 | 3 | 2 |
| **WS.CO5** | 3 | 2 | 2 | 2 | 3 | 3 | - | - | 2 | 2 | 2 | 3 | 2 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Average** | **2.3** | **2.2** | **2.2** | **2.5** | **2.2** | **2.3** | **-** | **-** | **2.0** | **2.0** | **2.4** | **3.0** | **2.2** |

**Course Outcomes:**

| **Semester No:** | **VIII** | | |
|---|---|---|---|
| **Course Title:** | **Software Project Management** | **Course Code:** | **U21IT804** |
| **Course Outcome No.** | **Description** | | |
| **SPM.CO1** | Explain Project management principles and control mechanisms in software projects. | | |
| **SPM.CO2** | Calculate software size, effort, cost using standard techniques at each stage of the software development life cycle (SDLC). | | |
| **SPM.CO3** | Apply activity planning, scheduling, CPM–PERT techniques, and risk management methods to develop efficient project plans and cost-effective schedules.. | | |
| **SPM.CO4** | Analyze project management and control techniques | | |
| **SPM.CO5** | Analyse staffing approaches, team structures, motivation models, and communication plans to improve software project team effectiveness. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| **Course Outcomes (CO's)** | **Program Outcomes (PO)** | | | | | | | | | | | **Program Specific Outcomes (PSO's)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **SPM.CO1** | 3 | 2 | 2 | - | - | 1 | - | - | - | - | 1 | 2 | 2 |
| **SPM.CO2** | 3 | 3 | 2 | - | - | 1 | - | - | - | - | 1 | 3 | 3 |
| **SPM.CO3** | 2 | 3 | - | 2 | - | 1 | - | - | - | 3 | 1 | 3 | 2 |
| **SPM.CO4** | 3 | 3 | 2 | 3 | - | - | 3 | - | - | 3 | 2 | 2 | 3 |
| **SPM.CO5** | 3 | 2 | - | - | - | 1 | 2 | 1 | - | 2 | 2 | 1 | 3 |
| **Average** | **2.8** | **2.6** | **2** | **2.5** | **-** | **1** | **2.5** | **1** | **-** | **2.6** | **1.4** | **2.2** | **2.6** |

**Course Outcomes:**

| Semester No: | VIII | | |
|---|---|---|---|
| Course Title: | Digital Forensics | Course Code: | U21IT807 |
| Course Outcome No. | Description | | |
| DF.CO1 | Explain computer forensics fundamentals, computer crimes, digital evidence, and related legal and privacy issues. | | |
| DF.CO2 | Choose systematic procedures and tools to conduct corporate high-tech computer investigations. | | |
| DF.CO3 | Produce digital evidence using appropriate forensic methods and acquisition tools. | | |
| DF.CO4 | Categorize computer crime scenes by securely seizing, hashing, storing digital evidence, and reviewing cases. | | |
| DF.CO5 | Analyze modern forensic tools and perform email and remote digital investigations, including detection of data-hiding techniques. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| Course Outcomes (CO's) | Program Outcomes (PO) | | | | | | | | | | | Program Specific Outcomes (PSO's) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| DF.CO1 | 3 | 2 | - | - | - | 1 | 2 | - | - | - | 1 | 2 | 1 |
| DF.CO2 | 3 | 3 | - | 2 | 3 | - | - | - | - | - | 1 | 3 | 2 |
| DF.CO3 | 2 | 3 | - | 3 | 2 | - | 1 | - | - | - | 1 | 3 | 3 |
| DF.CO4 | 2 | 2 | - | 1 | 3 | - | - | - | - | - | 1 | 3 | 2 |
| DF.CO5 | 2 | 2 | - | 3 | 2 | - | - | - | - | - | 1 | 2 | 3 |
| **Average** | **2.4** | **2.4** | **-** | **2.25** | **2.5** | **1** | **1.5** | **-** | **-** | | **1** | **2.6** | **2.2** |

**Course Outcomes:**

| Semester No: | VIII | | |
|---|---|---|---|
| Course Title: | Green Building Technology | Course Code: | U21CE806 |
| Course Outcome No. | Description | | |
| GBT.CO1 | Define sustainability and a green building, along with its features and benefits | | |
| GBT.CO2 | Describe the criteria used for site selection and water efficiency methods. | | |
| GBT.CO3 | Explain the energy efficiency terms and methods used in green building practices. | | |
| GBT.CO4 | Select materials for sustainable built environment & adopt waste management methods. | | |
| GBT.CO5 | Describe the methods used to maintain indoor environmental quality. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| Course Outcomes (CO's) | Program Outcomes (PO) | | | | | | | | | | | Program Specific Outcomes (PSO's) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| GBT.CO1 | 3 | 1 | - | - | - | 1 | 3 | - | - | - | - | 2 | 1 |
| GBT.CO2 | 3 | 2 | 2 | - | - | 2 | 3 | - | - | - | - | 2 | 2 |
| GBT.CO3 | 3 | 2 | 2 | - | 2 | - | 3 | - | - | - | - | 2 | 2 |
| GBT.CO4 | 2 | 2 | 3 | - | - | 2 | 3 | - | - | - | - | 3 | 2 |
| GBT.CO5 | 2 | 1 | - | - | - | 2 | 3 | - | - | - | - | 2 | 1 |
| **Average** | **2.2** | **1.6** | **2.3** | **-** | **2** | **1.7** | **3** | **-** | **-** | **-** | **-** | **2.2** | **1.6** |

**Course Outcomes:**

| Semester No: | VIII | | |
|---|---|---|---|
| **Course Title:** | **Technical Seminar** | **Course Code:** | **U21IT8P1** |
| **Course Outcome No.** | **Description** | | |
| **TS.CO1** | Collect, organize, analyze, and consolidate information about emerging technologies from relevant literature sources. | | |
| **TS.CO2** | Exhibit effective communication skills, including stage presence, courage, and confidence, during presentations. | | |
| **TS.CO3** | Demonstrate self-confidence, adaptability and professionalism in engaging with peers and faculty, improving interpersonal skills. | | |
| **TS.CO4** | Defend critics and explain new innovations and inventions in the relevant field, demonstrating a comprehensive understanding of technological advancements. | | |
| **TS.CO5** | Compose a report, summarizing key findings and insights derived from the overall study by presenting them coherently and concisely. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| Course Outcomes (CO's) | Program Outcomes (PO) | | | | | | | | | | | Program Specific Outcomes (PSO's) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **TS.CO1** | 3 | 3 | - | 2 | - | - | - | - | - | - | 2 | 2 | 3 |
| **TS.CO2** | 1 | - | - | - | 2 | - | 2 | 2 | 3 | - | 2 | 3 | 2 |
| **TS.CO3** | 2 | | 3 | - | 1 | 1 | - | 2 | - | 1 | 2 | 3 | 3 |
| **TS.CO4** | 3 | 2 | 1 | 3 | 2 | - | - | 3 | 2 | - | 2 | 3 | 3 |
| **TS.CO5** | 2 | - | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 3 |
| **Average** | **2.2** | **2.5** | **2** | **2.66** | **2** | **1.5** | **2** | **2.5** | **2.66** | **1** | **2.2** | **2.8** | **2.8** |

**Course Outcomes:**

| Semester No: | VIII | | |
|---|---|---|---|
| Course Title: | Project Phase-II | Course Code: | U21IT8P2 |
| **Course Outcome No.** | **Description** | | |
| **PP.CO1** | Demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program related to the real-world problems. | | |
| **PP.CO2** | Organize and examine different solutions based on economic, technical and functional feasibilities. | | |
| **PP.CO3** | Provide support and interpret the critics for implementing the better solutions to formulate the robust project. | | |
| **PP.CO4** | Design and develop a model using technical and functional provisions to make the formulated solutions. | | |
| **PP.CO5** | Compose the project components and apply documentation standards to prepare the project report and present the project work. | | |

**Course Articulation Matrix:**

**Mapping of Course Outcomes (CO) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):**

| Course Outcomes (CO's) | Program Outcomes (PO) | | | | | | | | | | | Program Specific Outcomes (PSO's) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PSO1** | **PSO2** |
| **PP.CO1** | 3 | 2 | - | 2 | 1 | - | - | - | - | - | 2 | 3 | 2 |
| **PP.CO2** | 2 | 3 | 2 | 3 | - | - | - | - | - | 1 | 2 | 2 | 3 |
| **PP.CO3** | 3 | 2 | 3 | 3 | 2 | 2 | - | - | - | - | 3 | 3 | 3 |
| **PP.CO4** | 3 | 2 | 3 | 1 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **PP.CO5** | 2 | - | 3 | - | 2 | 1 | 3 | 3 | 2 | 2 | 3 | 3 | 3 |
| **Average** | **2.6** | **2.25** | **2.75** | **2.25** | **2.66** | **1.66** | **3** | **3** | **2.5** | **1.66** | **2.6** | **2.8** | **2.8** |