

# **Curriculum For Master of Computer Application (MCA) (Pattern2024)**

**With Effect from A.Y. 2024-25**



**Matoshri Education Society's  
Matoshri College of Engineering and Research  
Centre, Eklahare, Nashik  
(Autonomous)**

**NBA and NAAC Accredited, Approved by All India Council for Technical Education, New Delhi,  
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## Curriculum for Post Graduate Programme- MCA (Pattern 2024)

Matoshri College of Engineering and Research Centre, Eklahare, Nashik has been granted the academic autonomous status from academic year 2024-25 by University Grant Commission. The Academic autonomous status has been considered as an opportunity for imparting comprehensive education. The academic autonomous status can be utilized to implement the National Education Policy (NEP 2020) effectively. The institute has a prudent plan to incorporate necessary dynamism in academic structure to march towards the vision of the institute and develop the research and skill oriented human resources contributing to the development of the nation.

With a focus on staying at the forefront of educational innovation, the institution diligently prepares curricula that are both dynamic and industry-aligned. This process entails meticulous planning and collaboration to ensure the development of comprehensive programs catering to the evolving needs of students and industries alike.

The highlights of Master of Computer Application (MCA) curriculum:

- Every Post Graduate programme is of two years duration with four semesters.
- The curricula have been designed adhering to the NEP guidelines and norms.
- Efforts have been taken to design the curricula which are unambiguous and self explanatory.
- Students have to earn 84 credits for the award of MCA degree

### Credit Requirement and Eligibility for the PG Programme

Eligibility first year PG admissions will be as per guidelines provided by Admission Regulating Authority of Government of Maharashtra and guidelines of NEP2020.

### Examination and Passing

#### Rules of Passing

- To pass the course, the student has to earn a minimum of 40 percent marks in End Semester exam and 40 percent average marks (In-Semester marks + End-Semester marks) in the exam head.
- Students can earn the credit of the course if he/she passes the course with appropriate grade.
- The student is declared as PASS in the corresponding year if he/she earns the credits of all the courses of the year.
- A student will be awarded the master's degree if he/she earns 84 credits.

#### Rules of A.T.K.T.

The students who is not detained to appear in examination either in first semester or second semester of First year and, has filled the form of examination is eligible to take admission in second year of PG course.

#### Exit Point

For those who join 2 year PG programmes, there shall only be one exit point. Students who exit at the end of 1st year shall be awarded a Postgraduate Diploma.

#### This document includes-

- [Credit Distribution Across Semesters and Course Code Nomenclature](#)
- [Examination Heads and Assessment Schemes](#)
- [Various Courses' Categories, Description and Abbreviation](#)
- [Program Outcomes](#)
- [Four Semesters Course Structures](#)
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- [Curriculum for semester I](#)
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- [Curriculum for semester III](#)
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## **Preface**

This is **Version 2** of the **FYMCA Curriculum 2024**. The following changes have been made compared to **Version 1**:

- 1. Modification in Semester II Course Structure (Table No. 7) –**
  - a.** Inclusion of the course **Human Rights**.
  - b.** The **Web Technology** course has been reduced from **4 lectures to 2 lectures**.
  - c.** Only **PR** is retained for **Software Lab II and Program Elective Course 2 Lab**.
  - d.** The exam head for course **Mobile Application Development** is **PR** instead of **Seminar**.
  
- 2. Modification in Semester III Course Structure (Table No. 8) –**
  - a.** Students who had opted Cyber Security as Program Elective Course 1 will study Blockchain Technology.
  
- 3. Modification in Semester IV Course Structure (Table No. 9) –**
  - a.** Inclusion of **Skill Development Course** with **2** credits.
  - b.** Internship Marks Total has been reduced from **250 Marks to 200 Marks**.
  - c.** The **MOOC** course has been reduced from **4 Credits to 2 Credits**.
  
- 4. Course Contents for Semesters II, III, and IV are included.**

| <b>Matoshri College of Engineering and Research Centre (Autonomous)</b><br><b>Curriculum for</b><br><b>Master of Computer Application (MCA) 2024-25</b> |  |                 |
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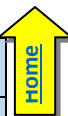
| <b>Table 1: Total Credit and Total Marks for Master of Computer Application (MCA)</b> |                      |                    |
|---|----------------------|--------------------|
| <b>Semester</b>   | <b>Total Credits</b> | <b>Total Marks</b> |
| I   | 22                   | 650                |
| II  | 22                   | 650                |
| III   | 20                   | 600                |
| IV  | 20                   | 600                |
| <b>Total</b>  | <b>84</b>            | <b>2500</b>        |

| <b>Table 2: Nomenclature for Course Codes</b>  |                                  |   |                                       |           |            |           |           |
|--|----------------------------------|---|---------------------------------------|-----------|------------|-----------|-----------|
| <b>Format for Course Codes-</b><br><b>YY</b> - Year of Course launch<br><b>U/P</b> - U: Undergraduate <b>P</b> - Postgraduate<br><b>NN</b> - Branch Code <b>MM</b> - Course Number |                                  |   |                                       |           |            |           |           |
|  |                                  | <table border="1"> <tr> <td><b>YY</b></td><td><b>U/P</b></td><td><b>NN</b></td><td><b>MM</b></td></tr> </table> |                                       | <b>YY</b> | <b>U/P</b> | <b>NN</b> | <b>MM</b> |
| <b>YY</b>  | <b>U/P</b>                       | <b>NN</b>   | <b>MM</b>                             |           |            |           |           |
| <b>NN</b>  | <b>Post Graduate Programme</b>   | <b>NN</b>   | <b>Post Graduate Programme</b>        |           |            |           |           |
| 10   | M.Tech. Geotechnical Engineering | 13  | M.Tech. Electrical Power Systems      |           |            |           |           |
| 11   | M.Tech. Data Science             | 14  | M.Tech. Heat Power Engineering        |           |            |           |           |
| 12   | M.Tech. VLSI and Embedded System | 15  | Master of Computer Applications (MCA) |           |            |           |           |

**Table 3: Examination Heads and Assessment Schemes**

| Exam Head                         | Abbreviation | In Semester Exam<br>(40% of Total Marks)   |  | End Semester Exam<br>(60% of Total Marks)   |
|-----------------------------------|--------------|--|--|---|
|                                   |              | In_Sem_Exam_1<br>( 20% )   | In_Sem_Exam_2<br>(20%)   |   |
| <b>Theory</b>                     | <b>TH</b>    | CAT/CCE based on 20% curriculum  | CAT/CCE based on 20% curriculum  | Theory examination based on 60% curriculum  |
| <b>Project</b>                    | <b>PROJ</b>  | Progress Review I with Demonstration, Presentation, Oral & Report  | Progress Review II with Demonstration, Presentation, Oral & Report                         | Activity, Presentation, Demonstration, Oral & Report as applicable                                  |
| <b>Internship</b>                 | <b>INT</b>   | Progress Review I with Activity, Presentation, Demonstration, Oral & Report as applicable  | Progress Review II with Activity, Presentation, Demonstration, Oral & Report as applicable | Activity, Presentation, Demonstration, Oral & Report as applicable                                  |
| <b>Practical</b>                  | <b>PR</b>    | Mid-semester exam based on experiment/ activity performance, demonstration, Presentation, Oral and Journal, Report as applicable   |  | Experiment, activity performance, demonstration, Presentation, Oral & Report, journal as applicable |
| <b>Term work</b>                  | <b>TW</b>    | Mid-semester exam based on experiment/ activity performance, demonstration, Presentation, Oral and Journal, Report as applicable   |  | Activity, Experiment performance, demonstration, Presentation, Oral & Report, journal as applicable |
| <b>Seminar</b>                    | <b>SEMI</b>  | Mid-semester review based on topic of study, literature study, draft of paper manuscript, report(s) and other as applicable  |  | Discussions, Presentation, Report(s), publication as applicable                                     |
| <b>Continuous Assessment Test</b> | <b>CAT</b>   | Class test examination to assess and evaluate a student's progress with descriptive or objective questions as measure of the student's knowledge and skills in online or offline mode. |  |   |

|  |            |   |
|--|------------|---|
| <b>Continuous<br/>and<br/>Comprehensive<br/>Evaluation</b> | <b>CCE</b> | Examination that evaluate learners' abilities based on various dimensions viz- academic performance, work experience, skills, coordination, agility, innovation, teamwork, public speaking, behavior, and similar as a measure of knowledge, skills and attitude. |
|--|------------|---|



| <b>Table 4: Various Courses' Categories, Description and Abbreviation</b>     |   |                      |
|---|---|----------------------|
| <b>Broad Category</b>   | <b>Description</b>  | <b>Abbreviations</b> |
| <b>Program Courses</b>  | Programme Core Course   | PCC                  |
|   | Programme Core Course Lab   | PCCL                 |
|   | Programme Elective Course   | PEC                  |
|   | Programme Elective Course Lab   | PECL                 |
| <b>Multidisciplinary Courses</b>  | Multidisciplinary Course  | MDC                  |
|   | Generic Elective  | GE                   |
| <b>Experiential Learning Courses</b>  | Project   | PROJ                 |
|   | Internship / On Job Training  | INT / OJT            |
| <b>Course Type/<br/>Teaching Learning<br/>Schemes / Examination<br/>Heads</b> | Practical   | PR                   |
|   | Internship  | INT                  |
|   | Theory  | TH                   |
|   | Tutorial  | TUT                  |
|   | Lecture   | Lect                 |
|   | Laboratory Course   | Lab                  |
|   | Term work   | TW                   |
|   | Seminar   | SEMI                 |
| <b>MOOC</b>   | Massive Open Online Courses by NPTEL under SWAYAM   | MOOC                 |
| <b>Project Management, Finance and Governance</b>                             | Project Planning/ Entrepreneurship Development / Engineering Economics / Management/ Corporate Laws/ Corporate Governance | PMFG                 |
| <b>In Semester Examination</b>  | In_Sem_Exam   | ISE                  |
| <b>Continuous Assessment Test</b>   | Continuous Assessment Test  | CAT                  |
| <b>End Semester Examination</b>   | End_Sem_Exam  | ESE                  |
| <b>Continuous &amp; Comprehensive Evaluation</b>                              | Continuous & Comprehensive Evaluation   | CCE                  |
| <b>Bloom's Taxonomy</b>   | Bloom's Taxonomy  | BL                   |
| <b>Course Outcome</b>   | Course Outcome  | CO                   |
| <b>Program Outcome</b>  | Program Outcome   | PO                   |
| <b>Ability Education Course</b>   | Ability Education Course  | AEC                  |



**Table 5: Program Outcomes**

At the end of Post Graduate Program, a student would have:

|             |   |
|-------------|---|
| <b>PO1</b>  | <b>Computational Knowledge:</b> Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.                      |
| <b>PO2</b>  | <b>Problem Analysis:</b> Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.  |
| <b>PO3</b>  | <b>Design /Development of Solutions:</b> Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. |
| <b>PO4</b>  | <b>Conduct investigations of complex Computing problems:</b> 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.   |
| <b>PO5</b>  | <b>Modern Tool Usage:</b> Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.  |
| <b>PO6</b>  | <b>Professional Ethics:</b> Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.  |
| <b>PO7</b>  | <b>Life-long Learning:</b> Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.   |
| <b>PO8</b>  | <b>Project management and finance:</b> Demonstrate knowledge and understanding of the computing 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.  |
| <b>PO9</b>  | <b>Communication Efficacy:</b> Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.   |
| <b>PO10</b> | <b>Societal and Environmental Concern:</b> Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.   |
| <b>PO11</b> | <b>Individual and Team Work:</b> Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.  |
| <b>PO12</b> | <b>Innovation and Entrepreneurship:</b> Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.   |

**Program Specific Outcomes**

At the end of Post Graduate Program,

|             |   |
|-------------|---|
| <b>PSO1</b> | Student will be able to apply advanced statistical and machine learning techniques to conduct Innovative research and develop data-driven solution to complex problems in data science, while fostering lifelong learning skills to stay at the forefront of evolving technologies and methodologies. |
| <b>PSO2</b> | Graduates will be capable of conducting comprehensive system analysis and design, applying various methodologies and tools to access user requirement and create efficient, scalable system architecture.   |
| <b>PSO3</b> | Student will stay abreast of emerging technologies and trends in IT industry, enabling them to integrate new tools and methodologies into their projects and adapt changing technological landscapes.   |



**Matoshri College of Engineering and Research Centre, Nashik**  
**Curriculum Structure for Master of Computer Application (MCA) (Course 2024)**

**Table 6: First Year Master of Computer Application (FY MCA)**  
**Semester I**

| Courses           |             |   |           | Teaching Scheme<br>Hrs/Week |     |    | Examination and Marks<br>(% of Total Curriculum and Marks) |     |                          |       | Credit |     |    |       |
|-------------------|-------------|---|-----------|-----------------------------|-----|----|--|-----|--------------------------|-------|--------|-----|----|-------|
|                   |             |   |           |                             |     |    | In_Sem Exam<br>(40%)                                       |     | End_Sem<br>Exam<br>(60%) | Marks |        |     |    |       |
| Course Code       | Course Type | Title of Course                         | Exam Head | Lect                        | TUT | PR | CAT  | CCE | ESE                      | Total | TH     | TUT | PR | Total |
| 24P1501           | MDC         | Statistical Foundation for Data Science | TH        | 04                          | -   | -  | 20   | 20  | 60                       | 100   | 4      | -   | -  | 04    |
| 24P1502           | PCC         | Software Testing and Quality Assurance  | TH        | 04                          | -   | -  | 20   | 20  | 60                       | 100   | 4      | -   | -  | 04    |
| 24P1503           | PCC         | Python Programming                      | TH        | 02                          | -   | -  | 20   | 20  | 60                       | 100   | 2      | -   | -  | 02    |
| 24P1504           | PCC         | Artificial Intelligence                 | TH        | 04                          | -   | -  | 20   | 20  | 60                       | 100   | 4      | -   | -  | 04    |
| 24P1505           | PEC         | Program Elective Course 1               | TH        | 04                          | -   | -  | 20   | 20  | 60                       | 100   | 4      | -   | -  | 04    |
| 24P1506           | PCCL        | Software Lab I                          | PR        | -                           | -   | 04 | 20   |     | 30                       | 50    | -      | -   | 02 | 02    |
| 24P1507           | PECL        | Program Elective Course 1 Lab           | PR        | -                           | -   | 02 | 20   |     | 30                       | 50    | -      | -   | 01 | 01    |
| 24P1508           | PMFG        | Study of Indian Constitution            | SEMI      | -                           | 01  | -  | 20   |     | 30                       | 50    | -      | 1   | -  | 01    |
| Total             |             |   |           | 18                          | 01  | 06 | 260  |     | 390                      | 650   | 18     | 01  | 03 | 22    |
| Total Hours/ Week |             |   |           | 25                          |     |    | 650  |     |                          |       | 22     |     |    |       |

| Program Elective Course 1 |                                       |
|---------------------------|---------------------------------------|
| Course Code               | Course Name                           |
| 24P1505-A                 | Augmented Reality and Virtual Reality |
| 24P1505-B                 | Cyber Security                        |
| 24P1505-C                 | Operation Research                    |
| 24P1505-D                 | Database System and SQL               |
| 24P1505-E                 | Generic Elective **                   |

**\*\*GE:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek. A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa.



**Matoshri College of Engineering and Research Centre (Autonomous)**  
**Curriculum Structure for Master of Computer Application (MCA) (Course 2024)**

**Table 7: First Year Master of Computer Application (FY MCA)**  
**Semester II**

| Courses                  |             |                                |           | Teaching Scheme Hrs/Week |           |           | Examination and Marks<br>(% of Total Curriculum and Marks) |     |                       |            | Credit    |           |           |           |
|--------------------------|-------------|--------------------------------|-----------|--------------------------|-----------|-----------|--|-----|-----------------------|------------|-----------|-----------|-----------|-----------|
|                          |             |                                |           |                          |           |           | In_Sem Exam<br>(40%)                                       |     | End_Sem Exam<br>(60%) | Marks      |           |           |           |           |
| Course Code              | Course Type | Title of Course                | Exam Head | Lect                     | TUT       | PR        | CAT  | CCE | ESE                   | Total      | TH        | TUT       | PR        | Total     |
| 24P1509                  | PCC         | Data Science                   | TH        | 04                       | -         | -         | 20   | 20  | 60                    | 100        | 04        | -         | -         | 04        |
| 24P1510                  | PCC         | Java Programming               | TH        | 04                       | -         | -         | 20   | 20  | 60                    | 100        | 04        | -         | -         | 04        |
| 24P1511                  | PCC         | Web Technology                 | TH        | 02                       | -         | -         | 10   | 10  | 30                    | 50         | 02        | -         | -         | 02        |
| 24P1512                  | PEC         | Program Elective Course - 2    | TH        | 04                       | -         | -         | 20   | 20  | 60                    | 100        | 04        | -         | -         | 04        |
| 24P1513                  | PCCL        | Software Lab II                | PR        | -                        | -         | 04        | 40   |     | 60                    | 100        | -         | -         | 02        | 02        |
| 24P1514                  | PECL        | Program Elective Course 2 Lab  | PR        | -                        | -         | 04        | 40   |     | 60                    | 100        | -         | -         | 02        | 02        |
| 24P1515                  | VEC         | Mobile Application Development | PR        | -                        | 01        | 02        | 20   |     | 30                    | 50         | -         | 01        | 01        | 02        |
| 24P1516                  | AEC         | Human Rights                   | TW        | -                        | 02        | -         | 20   |     | 30                    | 50         | -         | 02        | -         | 02        |
| <b>Total</b>             |             |                                |           | <b>14</b>                | <b>03</b> | <b>10</b> | <b>260</b>   |     | <b>390</b>            | <b>650</b> | <b>14</b> | <b>03</b> | <b>05</b> | <b>22</b> |
| <b>Total Hours/ Week</b> |             |                                |           | <b>27</b>                |           |           | <b>650</b>   |     |                       | <b>650</b> | <b>22</b> |           |           | <b>22</b> |

| Program Elective Course 2 |                                     |
|---------------------------|-------------------------------------|
| Course Code               | Course Name                         |
| 24P1512-A                 | Quantum Computing                   |
| 24P1512-B                 | Cloud Computing                     |
| 24P1512-C                 | Business Intelligence and Analytics |
| 24P1512-D                 | UI/UX Design                        |
| 24P1512-E                 | Generic Elective **                 |

**\*\*GE:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek. A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa.

**Matoshri College of Engineering and Research Centre (Autonomous)**  
**Curriculum Structure for Master of Computer Application (MCA) (Course 2024)**



**Table 8: Second Year Master of Computer Application (SY MCA)**  
**Semester III**

| Courses           |             |  |           | Teaching Scheme<br>Hrs/Week |     |    | Examination and Marks<br>(% of Total Curriculum and Marks) |     |                       |       | Credit |     |    |       |
|-------------------|-------------|--|-----------|-----------------------------|-----|----|--|-----|-----------------------|-------|--------|-----|----|-------|
|                   |             |  |           |                             |     |    | In_Sem Exam<br>(40%)                                       |     | End_Sem Exam<br>(60%) | Marks |        |     |    |       |
| Course Code       | Course Type | Title of Course                          | Exam Head | Lect                        | TUT | PR | CCE  | CCE | ESE                   | Total | TH     | TUT | PR | Total |
| 24P1517           | PCC         | Machine Learning                         | TH        | 04                          | -   | -  | 20   | 20  | 60                    | 100   | 04     | -   | -  | 04    |
| 24P1518           | PCC         | Cyber Security## / Blockchain Technology | TH        | 04                          | -   | -  | 20   | 20  | 60                    | 100   | 04     | -   | -  | 04    |
| 24P1519           | PEC         | Program Elective Course -3               | TH        | 04                          | -   | -  | 20   | 20  | 60                    | 100   | 04     | -   | -  | 04    |
| 24P1520           | PCCL        | Programming Lab 3                        | PR        | -                           | -   | 02 | 20   |     | 30                    | 50    | -      | -   | 01 | 01    |
| 24P1521           | PMFG        | Digital Marketing                        | SEMI      | -                           | 01  | -  | 20   |     | 30                    | 50    | -      | 01  | -  | 01    |
| 24P1522           | PROJ        | Project Stage-I                          | PROJ      | -                           | -   | 12 | 40   | 40  | 120                   | 200   | -      | -   | 06 | 06    |
| Total             |             |  |           | 12                          | 01  | 14 | 240  |     | 360                   | 600   | 12     | 01  | 07 | 20    |
| Total Hours/ Week |             |  |           | 27                          |     |    | 600  |     |                       |       | 20     |     |    |       |

| Program Elective Course 3 |  |
|---------------------------|--|
| Course Code               | Course Name                                    |
| 24P1519-A                 | Industry 4.0 And Industrial Internet Of Things |
| 24P1519-B                 | Natural Language Processing                    |
| 24P1519-C                 | Advanced Java                                  |
| 24P1519-D                 | Deep Learning                                  |
| 24P1519-E                 | Generic Elective **                            |

**##:** Students who had opted Cyber Security as Program Elective Course 1 will study Blockchain Technology as Course here.

**\*\*GE:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek. A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa.



**Matoshri College of Engineering and Research Centre (Autonomous)**  
**Curriculum Structure for Master of Computer Application (MCA) (Course 2024)**

**Table 9: Second Year Master of Computer Application (SY MCA)**  
**Semester IV**

| Courses           |                |   |              | Teaching Scheme<br>Hrs/Week |     |    | Examination and Marks<br>(% of Total Curriculum and Marks) |     |                          |       | Credit |     |    |       |
|-------------------|----------------|---|--------------|-----------------------------|-----|----|--|-----|--------------------------|-------|--------|-----|----|-------|
|                   |                |   |              |                             |     |    | In_Sem Exam<br>(40%)                                       |     | End_Sem<br>Exam<br>(60%) | Marks |        |     |    |       |
| Course<br>Code    | Course<br>Type | Title of Course                                   | Exam<br>Head | Lect                        | TUT | PR | CCE  | CCE | ESE                      | Total | TH     | TUT | PR | Total |
| 24P1523           | INT            | Internship\$                                      | TW           | -                           | -   | \$ | 40   | 40  | 120                      | 200   | -      | -   | 8  | 8     |
| 24P1524           | PCC            | MOOC Course                                       | TH           | 2                           | -   | -  | 20   | 20  | 60                       | 100   | 2      | -   | -  | 2     |
| 24P1525           | SEC            | Skill Development Course<br>(Data Analytics Tool) | PR           | -                           | 1   | 2  | 10   | 10  | 30                       | 50    | -      | 1   | 1  | 2     |
| 24P1526           | PROJ           | Project Stage-II                                  | PROJ         | -                           | -   | 16 | 50   | 50  | 150                      | 250   | -      | -   | 8  | 8     |
| Total             |                |   |              | 2                           | 1   | 18 | 240  |     | 360                      | 600   | 2      | 1   | 17 | 20    |
| Total Hours/ Week |                |   |              | -                           |     |    | 600  |     |                          |       | 20     |     |    |       |

**MOOC\_4: NPTEL Courses under SWAYAM for AY 2025-26**

| Course Code | Course Name^  |
|-------------|---|
| 24P1424-A   | ^Note: Course Names will be declared as per availability of NPTEL courses of 12/16 weeks available in that particular year for the semester |
| 24P1424-B   |   |
| 24P1424-C   |   |
| 24P1424-D   |   |

**\$ Internship:**

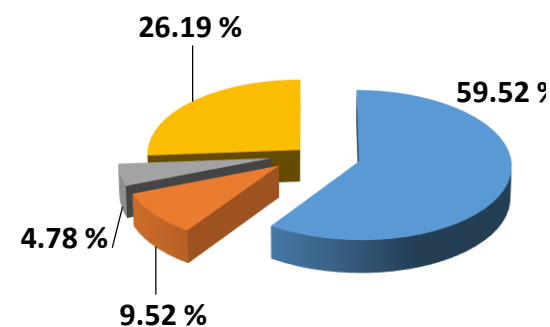
- Internship corresponding to major courses is to be completed after semester III Examinations and before commencement of semester IV of at least 180 hours/ 6 weeks; and it is to be assessed and evaluated in semester IV.
- It is almost imperative that the commencement of Semester IV needs to be approx. 3 weeks beyond the schedule.

Dr. Swati A. Bhavsar  
Chairman, BoS  
Computer Engineering



Table 10: Broad Courses' Categories, and Credit Distribution

| Broad Category  | Description                    | Credit    | Total Credit | %            |
|---|--------------------------------|-----------|--------------|--------------|
| <b>Program Courses</b><br><b>Total Credit= 50</b><br><b>59.52%</b><br><b>(19.00 % in online mode)</b> | Programme Core Course          | 30        | 35           | <b>41.66</b> |
|   | Programme Core Course Lab      | 05        |              |              |
|   | Programme Elective Course      | 12        | 15           | <b>17.85</b> |
|   | Programme Elective Course Lab  | 03        |              |              |
| <b>Multidisciplinary Courses</b><br><b>Total Credit = 26</b><br><b>09.52%</b>                         | Multidisciplinary Course       | 08        | 08           | <b>09.52</b> |
| <b>Project Management, Finance, and Governance</b><br><b>Total Credit =04</b><br><b>04.78%</b>        | Study of Indian Constitution   | 01        | 04           | <b>04.78</b> |
|   | Project Management and Finance | 02        |              |              |
|   | Company Law and Governance     | 01        |              |              |
| <b>Experiential Learning Courses</b><br><b>Total Credit =22</b><br><b>26.19%</b>                      | Project                        | 14        | 22           | <b>26.19</b> |
|   | Internship / On Job Training   | 08        |              |              |
| <b>Total</b>  |                                | <b>84</b> | <b>84</b>    | <b>100</b>   |



- Program Core Courses
- Multidisciplinary Courses
- Finance, Management, Governance
- Project and Internship

# Semester I



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application) 2024-25**  
**First Year MCA (FYMCA)**

**24P1501: Statistical Foundation for Data Science**

| Teaching Scheme   | Credit | Examination Head: TH  |
|-------------------|--------|---|
|                   |        | Examination Scheme & Marks  |
| TH: 04 Hours/Week | 04     | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |

**Companion Course, if any:** Python Programming(24P1503), Software Lab 1(24P1506)

**Course Objectives:**

- To develop the fundamental knowledge and understand concepts to become a data science professional.
- To develop predictive models to forecast future trends and outcomes.
- To apply statistical concepts and probability distributions to different real-world problems.
- To understand fundamental concepts of statistics and probability theory.
- To construct and evaluate simple and multiple regression models through visualization techniques

| Course Outcomes: On completion of the course, learner will be able to–  | BL |
|---|----|
| <b>CO1: Demonstrate</b> flow process for data science problems.   | 3  |
| <b>CO2: Analyze</b> the mathematical concepts like probability distributions and statistics for different domains of data science.  | 4  |
| <b>CO3: Apply</b> statistical techniques and models to analyze data and draw conclusions.   | 3  |
| <b>CO4: Analyze</b> various mathematical and statistical knowledge gained to demonstrate the problems arising in practical situations. Analyze data pertaining to attributes and to interpret the results.  | 4  |
| <b>CO5: Evaluate</b> the results of hypothesis testing to determine the validity of a research question.  | 6  |
| <b>CO6: Develop</b> the ability to independently apply advanced probability distributions, statistical analysis, and regression techniques to investigate and solve complex research problems, present research findings through comprehensive technical report, and demonstrate expertise in these analytical methods. | 5  |

**Course Contents**

| Unit I  | Introduction to Data Science   | (08 Hrs.) |
|---|--|-----------|
| What is Data Science, Need of Data Science, Big data and Data Science, The current Scenario, Industry Perspective Types of Data: Structured vs. Unstructured Data, Quantitative vs. Categorical Data, Big Data vs. Little Data, Data science process, Role of Data Scientist.                         |  |           |
| Case Studies  | Discuss environmental conservation and data analysis   |           |
| Unit II   | Descriptive Statistics   | (08 Hrs.) |
| Need of statistics in Data Science and Big Data Analytics, Measures of Central Tendency: Mean Median, Mode, and Mid-range. Measures of Dispersion: Range, Variance, Mean Deviation, Standard Deviation, Quartiles. Skewness and Kurtosis, Correlation-Pearson correlation, Spearman Rank correlation. |  |           |
| Case Studies  | Collect the sample of Food Consumption Scores and discuss food insecurity using Measures of Central Tendency |           |
| Unit III  | Probability  | (08 Hrs.) |



Introduction to probability, sample space and events, permutations and combinations, Axioms of probability, conditional probability, Bayes Theorem.

|                     |  |
|---------------------|--|
| <b>Case Studies</b> | Discuss financial forecasting to assess the risk and return of investment portfolios using Bayes theorem |
|---------------------|--|

|                |                                  |                  |
|----------------|----------------------------------|------------------|
| <b>Unit IV</b> | <b>Probability Distributions</b> | <b>(08 Hrs.)</b> |
|----------------|----------------------------------|------------------|

Random Variables, Discrete probability densities, cumulative Distribution, mathematical Expectations, Geometric Distribution, Binomial distribution, Poisson distribution

|                     |  |
|---------------------|--|
| <b>Case Studies</b> | Discuss the average amount of time spend in waiting in traffic using probability |
|---------------------|--|

|               |                           |                  |
|---------------|---------------------------|------------------|
| <b>Unit V</b> | <b>Hypothesis Testing</b> | <b>(08 Hrs.)</b> |
|---------------|---------------------------|------------------|

Testing of hypothesis– Null and alternative hypothesis, Test - type I and type II error Hypothesis testing- t-test -One Sampled and two sampled tests, Correlation -Pearson correlation coefficient.

|                     |  |
|---------------------|--|
| <b>Case Studies</b> | Assess the Impact of Personalized Learning on Student Engagement |
|---------------------|--|

### Learning Resources:

#### Text Books:

1. Jeffrey S. Saltz, Jeffre M. Stanton, “An Introduction to Data Science”, Sage Publications, 2018
2. Theory and Problems of Probability, Seymour Lipschutz and Marc lars Lipson, 2nd Edition Schaum’s Outline Series, ISBN: 0-07-118356-6.
3. Larsen, Richard J., and Morris L. Marx: An Introduction to Mathematical Statistics and its Applications, Pearson Education, 2017.

#### Reference Books:

1. T. Hastie, R. Tibshirani, J. H. Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction. Springer, 2013.
2. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data. Cambridge University Press, 2012.

#### e-Books:

- An Introduction to Statistical Learning by Gareth James

<https://www.ime.unicamp.br/~dias/Intoduction%20to%20Statistical%20Learning.pdf>

#### MOOC Courses: <web links>

1. <https://nptel.ac.in/courses/106/106/106106179/>
2. Computer Science and Engineering - NOC: Data Science for Engineers

### The CO-PO Mapping Matrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1   | 2   | 3   | 3   | 3   | 3   | -   | 2   | -   | -   | -    | 2    | -    | 3    | 2    | 3    |
| CO2   | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | -    | 3    | 2    | 2    |
| CO3   | 1   | 3   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | 3    | 2    | 2    |
| CO4   | 3   | 3   | 3   | 1   | -   | -   | 3   | -   | -   | 3    | -    | -    | 3    | 2    | 2    |
| CO5   | 2   | 2   | 3   | 2   | 2   | -   | -   | 3   | 3   | 1    | -    | -    | 3    | 2    | 2    |
| CO6   | 3   | 3   | 3   | 3   | 3   | -   | -   | -   | 2   | 3    | 3    | 2    | 3    | 3    | 3    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application) 2024-25**  
**First Year MCA (FYMCA)**

**24P1502: Software Testing and Quality Assurance**

| Teaching Scheme   | Credit | Examination Head: TH  |
|-------------------|--------|---|
|                   |        | Examination Scheme & Marks  |
| TH: 04 Hours/Week | 04     | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |

**Companion Course, if any: Software Lab I(24P1506)**

**Course Objectives:**

- To know the importance of software testing and quality assurance
- To study white box and black box testing techniques
- To get acquainted with various testing types
- To study tools used for automation testing

| Course Outcomes: On completion of the course, learner will be able to–   | BL |
|--|----|
| <b>CO1: Demonstrate</b> different approaches of quality management, assurance, and quality standard to software system | 3  |
| <b>CO2: Design</b> test plan, test cases and defect repository using case study.                                       | 5  |
| <b>CO3: Illustrate</b> the concept of white box and black box testing techniques                                       | 3  |
| <b>CO4: Analyze</b> various testing types  | 4  |
| <b>CO5: Implement</b> waits to deal with elements that take time to load, ensuring robust automation tool.             | 3  |
| <b>CO6: Scrape</b> data from dynamic web pages using Selenium scripts.   | 3  |

**Course Contents**

| Unit I   | Fundamentals of Software Quality Assurance  | (08Hrs.)  |
|--|---|-----------|
| <b>FUNDAMENTALS OF SOFTWARE QUALITY:</b> Definition of Quality, QA, QC, SQA, SQA basics, Components of the Software Quality Assurance System, software quality in business context, planning for software quality assurance, product quality and process quality, software process models, 7 QC Tools and Modern Tools. <b>QUALITY ASSURANCE MODELS:</b> Models for Quality Assurance, ISO-9000 series, CMM, CMMI, Test Maturity Models, <b>SOFTWARE QUALITY ASSURANCE TRENDS:</b> Software Process-PSP and TSP, OO Methodology, Clean-room software engineering, Defect Injection and prevention, Internal Auditing and Assessments, Inspections & Walkthroughs, Case Tools and their effect on Software Quality. |   |           |
| <b>Case Studies</b>  | A software development company leading to missed deadlines and increased customer complaints. Discuss a structured Software Quality Assurance(QA) process to improve the situation. |           |
| Unit II  | Essentials of Software Testing  | (08 Hrs.) |
| <b>SOFTWARE TESTING BASICS:</b> Definition & Objectives of testing, testing life cycle, Software testing principles, The tester's role in a software development organization <b>TEST PLAN AND TEST CASES:</b> Preparation, Management and execution of Test Plan, Definition, Test Case Designing of Test Cases, prepared Test report. <b>DEFECT MANAGEMENT:</b> Origins of defects, Defect classes, The defect repository and test design, Defect examples, Developer /Tester support for developing a defect repository.  |   |           |
| <b>Case Studies</b>  | Discuss defect tracking process using systematic approach aimed at enhancing visibility and resolution times.   |           |
| Unit III   | Software Testing Techniques   | (08 Hrs.) |

|  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----------|------|------|
| WHITE-BOX TESTING METHODOLOGIES: Static testing: by humans, using static analysis tools, Structural Testing: unit/code functional testing, Code coverage Testing, Code Complexity testing, Mutation Testing<br>BLACK-BOX TESTING METHODOLOGIES: Requirement based testing, Positive and negative testing, Boundary Value analysis, Equivalence Partitioning, State based or Graph-based Testing, Compatibility Testing, User Documentation Testing, Domain Testing |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| Case Studies   | Discuss white box testing as a primary strategy to uncover vulnerabilities and improve software reliability, as the company prepared to launch a new online banking platform, it recognized the need for rigorous testing to ensure code quality and security.   |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| Unit IV  | Testing Strategies   |     |     |     |     |     |     |     |     |      |      |      | (08 Hrs.) |      |      |
| Integration testing, System and Acceptance testing, Scenario testing, Performance Testing, Regression testing, Ad hoc Testing, Usability and Accessibility Testing, GUI testing, Validation testing, Specification-based testing, Testing Object-Oriented Software, Testing Web Based Applications, Database Testing   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| Case Studies   | Discuss a range of software testing strategies aimed at improving product quality and reducing time-to-market if the company faced challenges in maintaining software quality amidst frequent feature updates and tight release schedules..                      |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| Unit V   | Selenium Tool  |     |     |     |     |     |     |     |     |      |      |      | (08 Hrs.) |      |      |
| Introduction to Selenium, Brief History of The Selenium Project, Selenium’s Tool Suite, Selenium IDE, Selenium RC, Selenium Web Driver, Selenium Grid, Test Design Considerations.   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| Case Studies   | With increasing user traffic and a growing number of features, MNO recognized the need for a robust automated testing solution to ensure the quality and reliability of its web applications. To improve testing efficiency and coverage discuss automated tool. |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| Learning Resources:  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| Text Books:  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 1. Srinivasan Desikan, Gopalaswamy Ramesh,Software Testing: Principles and Practices Pearson.  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 2. Daniel Galin, Software Quality Assurance: From Theory to Implementation, Pearson AddisonWesley  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| Reference Books:   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 1. Software Testing and Quality Assurance – Theory and Practice, Kshirasagar Naik, Priyadashi Tripathy, Wiley India, 2010  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 2. Rajani & Oak, “Software Testing: Methodology, Tools and Processes” Tata McGraw-Hill, 2007   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| e-Books: <web links>   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 1. Selenium 1.0 Testing Tool beginners guide by David Burns, ISBN: 1849510261, ISBN 13:9781849510264   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 2. Burnstein, “Practical Software Testing”, Springer International Edition, ISBN 81-8128-089-X   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| MOOC Courses: <web links>  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 1. <a href="https://www.my-mooc.com/en/mooc/software-testing-fundamentals/">https://www.my-mooc.com/en/mooc/software-testing-fundamentals/</a>   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 2. <a href="https://nptel.ac.in/courses/106/105/106105150/">https://nptel.ac.in/courses/106/105/106105150/</a>   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 3. <a href="https://onlinecourses.nptel.ac.in/noc19_cs71/preview">https://onlinecourses.nptel.ac.in/noc19_cs71/preview</a>   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| The CO-PO Mapping Matrix   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| CO\PO  | PO1  | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1      | PSO2 | PSO3 |
| CO1  | -  | -   | 2   | 2   | 3   | 2   | 3   | 3   | 2   | -    | -    | -    | 1         | 3    | 3    |
| CO2  | 2  | 1   | 3   | 3   | 3   | 2   | -   | 3   | 3   | -    | 2    | -    | 3         | 3    | 3    |
| CO3  | 1  | -   | 3   | 3   | 3   | -   | -   | 2   | 2   | -    | 2    | -    | 2         | 3    | 2    |
| CO4  | 1  | -   | 3   | 3   | 3   | -   | -   | 2   | 2   | -    | 2    | -    | 2         | 3    | 2    |
| CO5  | 2  | 2   | 3   | 3   | 3   | -   | -   | -   | 2   | -    | 2    | 2    | 3         | 3    | 3    |
| CO6  | 3  | 3   | 3   | 3   | 3   | 2   | -   | 2   | 2   | 3    | 3    | 3    | 2         | -    | 2    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application) 2024-25**  
**First Year MCA (FYMCA)**

**24P1503: Python Programming**

| Teaching Scheme   | Credit | Examination Head: TH  |
|-------------------|--------|---|
|                   |        | Examination Scheme & Marks  |
| TH: 02 Hours/Week | 02     | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |

**Companion Course, if any:** Software Laboratory I (24P1506)

**Course Objectives:**

- To learn the basics of Python Programming
- To understand the python data structure
- To build object-oriented programs with Python classes.
- To learn read and write files in Python programming language.
- To build Python modules and package for reusability.

| Course Outcomes: On completion of the course, learner will be able to   | BL |
|---|----|
| <b>CO1: Demonstrate</b> proficiency in Python programming by applying problem-solving skills and implementing various programming constructs for building applications. | 3  |
| <b>CO2: Express</b> proficiency in the handling of strings and functions.   | 2  |
| <b>CO3: Develop</b> problem-solving skills by implementing algorithms and data structures to solve real-world problems.   | 5  |
| <b>CO4: Create</b> Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.  | 5  |
| <b>CO5: Articulate</b> the object oriented programming concepts.  | 3  |
| <b>CO6: Understand</b> basic statistical concepts and their application in Python for different domains of data science and visualization of data.                      | 3  |

**Course Contents**

| Unit I  | Basics of Python   | (06 Hrs.) |
|---|--|-----------|
| Introduction to Python programming, Features of Python, Execution of a Python Program, variables and identifiers, Data Types, Input operation, Comments, Reserved words, Indentation, Operators and expressions, Expressions in Python. Decision control statement, branching Statements, Structures/Iterative statements, break, continue, pass, else statement used with loops. Comparisons between C and Python. |  |           |
| <b>Case Studies</b>   | Design a simple command-line To-Do List application to manage tasks.       |           |
| Unit II   | Python Data Collections  | (06 Hrs.) |
| Strings: Creating and storing strings, string operations, formatting strings. Lists: Basic List operations, Built-in functions used on lists, List Comprehensions. Tuples and Sets: Basic Operations on Tuples, Functions to Process Tuples. Set Methods, set operations. Dictionaries: Operations on Dictionaries, Dictionary Methods.   |  |           |
| <b>Case Studies</b>   | Analyze sales data using lists and loops and present the final statistics. |           |
| Unit III  | Functions, Modules and Packages  | (06 Hrs.) |

Functions: Calling Functions, Creating Functions, Formal Arguments, Positional Arguments, Default Arguments, Default Function Object Argument Example, Variable-length Arguments, Non-keyword Variable Arguments (Tuples), Keyword Variable Arguments (Dictionary), user defined functions and library functions, The return Statement and void Function, Scope and Lifetime of Variables, \*args and \*\*kwargs, Command Line Arguments. Modules: Standard Library modules, Commonly Used Modules, Categorizing the Standard Types, Unsupported Types. Packages: Understanding Packages Powerful Lambda or anonymous function in python

|                     |  |
|---------------------|--|
| <b>Case Studies</b> | Discuss Task Management System to help users organize their daily tasks. The system will allow users to add tasks, view tasks, mark tasks as complete, and delete tasks. Functions will be used to encapsulate the different operations. |
|---------------------|--|

|                |  |                  |
|----------------|--|------------------|
| <b>Unit IV</b> | <b>Files and Database Connectivity</b> | <b>(06 Hrs.)</b> |
|----------------|--|------------------|

Files and Database Connectivity: File Processing in python, Types of Databases Used with Python, Working with MySQL Database, Using MySQL from Python, Retrieving All Rows from a Table, Inserting Rows into a Table, Deleting Rows from a Table, Updating Rows in a Table, Creating Database Tables through Python

|                     |   |
|---------------------|---|
| <b>Case Studies</b> | Implement an Inventory Management System to keep track of products, suppliers, and sales. The system will help the store efficiently manage its inventory, generate reports, and handle stock levels. |
|---------------------|---|

|               |  |                  |
|---------------|--|------------------|
| <b>Unit V</b> | <b>Object-Oriented Programming Concept</b> | <b>(06 Hrs.)</b> |
|---------------|--|------------------|

Object Oriented programming, Python Objects, Standard Types, Other Built-in Types, Internal Types, scope, Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, and Polymorphism, Composition, containership, reusability, delegation, data abstraction

|                     |  |
|---------------------|--|
| <b>Case Studies</b> | Create a probabilistic model for credit card fraud detection |
|---------------------|--|

#### Learning Resources:

#### Text Books:

1. Core Python Programming: 2017 Edition, R. Nageswara Rao, DreamTech Publication.
2. Python for Data Analysis 2nd Edition, O'Reilly Publications
3. Core Python Programming, Wesley J Chun, 3rd Edition, Pearson Education.

#### Reference Books:

1. Professional Python, Sneeringer, Luke, 2016, John Wiley & Sons, ISBN -978-1-119-07085-6.
2. Mastering Python Fundamentals with ease, Asha Gowda KareGowda, Bhargavi K, LambartAcademic Publishing

**e-Books:** <web links><http://pkklib.iitk.ac.in/index.php/resources/e-books/e-text-books/33890:python-programming-using-problem-solving-approach>

**MOOC Courses:** <web links><https://archive.nptel.ac.in/courses/106/106/106106182/>

#### The CO-PO Mapping Matrix

| CO\PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b> | 3   | 3   | 3   | 3   | 3   | -   | 3   | -   | -   | -    | -    | -    | 3    | 3    | 3    |
| <b>CO2</b> | 3   | 3   | 3   | 2   | 2   | -   | 2   | -   | -   | -    | -    | -    | 3    | 2    | 3    |
| <b>CO3</b> | 3   | 3   | 3   | 2   | 2   | -   | 2   | -   | -   | -    | -    | -    | 3    | 2    | 1    |
| <b>CO4</b> | 3   | 3   | 3   | 2   | 2   | -   | -   | -   | 3   | -    | -    | -    | 3    | 2    | 2    |
| <b>CO5</b> | 3   | 3   | 3   | 3   | 2   | -   | -   | -   | -   | -    | -    | -    | 3    | 2    | 2    |
| <b>CO6</b> | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3    | 3    | 3    | 3    | 3    | 3    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application) 2024-25**  
**First Year MCA (FYMCA)**

**24P1504: Artificial Intelligence**

| Teaching Scheme   | Credit | Examination Head: TH                                    |
|-------------------|--------|---|
|                   |        | Examination Scheme & Marks                              |
| TH: 04 Hours/Week | 04     | ISE:<br>CAT: 20 Marks<br>CCE: 20 Marks<br>ESE: 60 Marks |

**Companion Course, if any: Data Science**

**Course Objectives:**

- To present an overview of artificial intelligence (AI) principles and approaches.
- Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, and learning.
- To understand Natural language processing and Expert systems

**Course Outcomes:** On completion of the course, learner will be able to–

|  | BL |
|--|----|
| <b>CO1: Demonstrate</b> the modern view of AI as the study of agents that receive precepts from the Environment and perform actions.                           | 3  |
| <b>CO2: Demonstrate</b> the use of various search techniques.  | 3  |
| <b>CO3: Apply</b> basic principles of AI in solutions that require problem-solving, inference, perception, knowledge representation, and learning.             | 3  |
| <b>CO4: Implement</b> ideas underlying the modern logical inference system.  | 3  |
| <b>CO5: Explain</b> about AI techniques for logical planning.  | 2  |
| <b>CO6: Demonstrate</b> and enrich knowledge to select and apply AI tools to synthesize information and develop models within constraints of application area. | 3  |

**Course Contents**

| Unit I   | Introduction to Artificial Intelligence   | (08 Hrs.) |
|--|---|-----------|
| Introduction: What Is AI, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, and Applications of AI. Intelligent Agents and Environments: Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents, How the components of agent programs work.  |   |           |
| Case Studies   | Discuss intelligent autonomous vehicles that can navigate complex urban environments with little to no human intervention   |           |
| Unit II  | Search Techniques   | (08 Hrs.) |
| Solving Problems by Searching: Study and analysis of Various searching algorithms. Implementation of Depth-first search Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search Informed (Heuristic) Search Strategies: Greedy best first search A* search: Minimizing the total estimated solution cost, Conditions for optimality: Admissibility and consistency, Optimality of A*, Heuristic Functions |   |           |
| Case Studies   | An autonomous vehicle (AV) company needed to design a system for route planning that ensures the vehicle navigates efficiently and safely in urban environments. The challenge was to find the shortest path to a destination while considering dynamic obstacles and real-time traffic data. |           |
| Unit III   | Knowledge Representation  | (08 Hrs.) |



|  |   |           |
|--|---|-----------|
| Definition of knowledge, properties for knowledge representation system, Issues of knowledge representations, Types of knowledge, Mappings Approaches to knowledge representations, knowledge using Rules, search Knowledge, predicate calculus-connectives, variables and quantification, Predicates and arguments, TMS (truth maintenance system), Statistical and probabilistic reasoning |   |           |
| Case Studies (if any)  | Discuss an intelligent diagnostic system that can assist doctors in diagnosing diseases based on patients' symptoms, medical history, and test results.   |           |
| Unit IV  | Reasoning   | (08 Hrs.) |
| Inference in First-Order Logic, Propositional vs. First-Order Inference, Unification and First-Order Inference, Forward Chaining, Backward Chaining, Resolution, Knowledge Representation, Ontological Engineering, Categories and Objects, Events, Mental Objects and Modal Logic, Reasoning Systems for Categories, Reasoning with Default Information                                     |   |           |
| Case Studies   | Discuss AI-powered expert system to assist lawyers in evaluating the outcomes of legal cases.   |           |
| Unit V   | Planning  | (08 Hrs.) |
| Introduction : Search in planning, search vs. planning, planning as problem solving, components of a planning, Forward planning, Nonlinear planning using constraint posting, Hierarchical planning  |   |           |
| Case Studies   | Discuss plan paths and tasks for each robot while dealing with the complexity of the warehouse layout, changing inventory positions, and potential robot collisions for a logistics company needed to automate the movement of goods in a large warehouse using autonomous robots.. |           |
| Learning Resources:  |   |           |
| Text Books:  |   |           |
| 1. Artificial Intelligence: A Modern Approach by Peter and Norvig ISBN-0-13- 103805  |   |           |
| Reference Books:   |   |           |
| 1. Artificial Intelligence by Elaine Rich, Kevin Knight and Nair ISBN-978-0-07- 008770-5, TMH,   |   |           |
| 2. Artificial Intelligence by Saroj Kausik ISBN:- 978-81-315-1099-5, Cengage Learning  |   |           |
| 3. Artificial Intelligence and Intelligent Systems by Padhy, Oxford University Press   |   |           |
| e-Books: <web links>   |   |           |
| 1. <a href="https://www.cin.ufpe.br/~tfl2/artificial-intelligence-modern approach.9780131038059.25368.pdf">https://www.cin.ufpe.br/~tfl2/artificial-intelligence-modern approach.9780131038059.25368.pdf</a>   |   |           |
| MOOC Courses: <web links>  |   |           |
| 1. <a href="https://nptel.ac.in/courses/106/105/106105077/">https://nptel.ac.in/courses/106/105/106105077/</a>   |   |           |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| <b>CO1</b>               | 1   | 2   | 2   | 1   | -   | -   | 1   | 3   | -   | 2    | -    | -    | 3    | 3    | 2    |
| <b>CO2</b>               | 1   | 3   | 3   | 2   | 3   | 1   | -   | 3   | 1   | 2    | -    | -    | 3    | 3    | 2    |
| <b>CO3</b>               | 1   | 2   | 2   | 1   | -   | -   | 1   | 3   | 1   | 2    | -    | -    | 3    | 3    | 1    |
| <b>CO4</b>               | 1   | 2   | 2   | 1   | -   | -   | 1   | 3   | 1   | 2    | -    | -    | 3    | 3    | 2    |
| <b>CO5</b>               | 2   | 2   | 2   | 2   | 3   | -   | 2   | -   | -   | -    | -    | -    | 3    | -    | 2    |
| <b>CO6</b>               | 2   | 2   | 2   | 2   | 3   | 1   | 2   | -   | -   | -    | -    | -    | 3    | 3    | 3    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application) 2024-25**  
**First Year MCA (FYMCA)**  
**Program Elective Course 1**

**24P1505-A: Augmented Reality and Virtual Reality**

| Teaching Scheme   | Credit | Examination Head: TH  |
|-------------------|--------|---|
|                   |        | Examination Scheme & Marks  |
| TH: 04 Hours/Week | 04     | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |

**Prerequisite:** Multimedia

**Companion Course, if any: Program Elective Course 1 Lab (24P1507)**

**Course Objectives:**

- To learn the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.
- To provide a foundation to the fast-growing field of AR and make the students aware of the various AR devices.

**Course Outcomes:** On completion of the course, learner will be able to– **BL**

**CO1: Demonstrate** a comprehensive understanding of the core principles, theories, and technologies that underpin Virtual Reality (VR). **3**

**CO2: Design** and develop interactive VR and AR applications using industry-standard tools. **5**

**CO3: Understand** the system of human vision and its implication on perception and rendering. **3**

**CO4: Summarize** the basic concept of Augmented Reality (AR) systems. **3**

**CO5: Demonstrate** the components of VR/AR hardware (e.g., head-mounted displays, sensors, cameras) and software platforms, understanding their functions and limitations in delivering immersive experiences. **3**

**CO6: Apply** problem-solving skills to address technical challenges in VR/AR development, such as optimization of performance, resolution of latency issues, and minimizing motion sickness for users. **3**

**Course Contents**

**Unit I** **Introduction to Virtual Reality** **(08 Hrs.)**

Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output Visual, Aural & Haptic Displays, Applications of Virtual Reality.

**Case Studies (if any)** Discuss how Virtual Reality (VR) simulation platform adopted for training medical students in surgical procedures.

**Unit II** **Representing the Virtual World** **(08 Hrs.)**

Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR, Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations, Human Eye, eye movements & implications for VR.

**Case Studies** Discuss how an architectural firm adopted **Virtual Reality (VR) technology** to offer clients fully immersive tours ("walk" through the virtual space) of buildings before they were constructed.

**Unit III** **Visual Perception & Rendering** **(08 Hrs.)**



Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates, Motion in Real and Virtual Worlds-Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Interaction - Motor Programs and Remapping, Locomotion, Manipulation, Social Interaction. Audio -The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering.

**Case Studies** Optimizing Rendering for Low-Latency VR Gaming

**Unit IV** **Introduction to Augmented Reality (A.R)** **(08 Hrs.)**

What Is Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality Augmented Reality Concepts - How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.

**Case Studies** Discuss Augmented Reality in Education - AR-based Learning

**Unit V** **Augmented Reality Hardware and Software** **(08 Hrs.)**

Augmented Reality Hardware – Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception, Requirements and Characteristics, Spatial Display Model. Processors – Role of Processors, Processor System Architecture, Processor Specifications. Tracking & Sensors - Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion. Computer Vision for Augmented Reality - Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking Augmented Reality Software

**Case Studies** Augmented Reality in Remote Assistance - Porsche and HoloLens 2

### Learning Resources

#### Text Books:

1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
2. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.
3. Allan Fowler-AR Game Developmentll, 1st Edition, A press Publications, 2018, ISBN 978-1484236178

#### Reference Books:

1. Gerard Jounghyun Kim, “Designing Virtual Systems: The Structured Approach”, 2005.
2. Burdea, Grigore C and Philippe Coiffet, “Virtual Reality Technology”, Wiley Interscience, India, 2003.

**e-Books:** <http://lavalle.pl/vr/book.html>

**MOOC Courses:** <https://www.coursera.org/learn/introduction-virtual-reality>

### The CO-PO Mapping Matrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1   | -   | 1   | 2   | 1   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | 3    |
| CO2   | 1   | 2   | 2   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | 3    |
| CO3   | 1   | 2   | 2   | 1   | 2   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | 3    |
| CO4   | 1   | 2   | 2   | -   | 2   | -   | -   | -   | -   | -    | -    | 1    | -    | -    | 2    |
| CO5   | 1   | 1   | 2   | 2   | 1   | -   | -   | -   | -   | -    | -    | 2    | 3    | -    | 2    |
| CO6   | 1   | 2   | 2   | 2   | 3   | -   | -   | -   | -   | -    | -    | 2    | -    | -    | 3    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application) 2024-25**  
**First Year MCA (FYMCA)**  
**Program Elective Course 1**

**24P1505-B: Cyber Security**

| Teaching Scheme   | Credit | Examination Head: TH                                    |
|-------------------|--------|---|
|                   |        | Examination Scheme & Marks                              |
| TH: 04 Hours/Week | 04     | ISE:<br>CAT: 20 Marks<br>CCE: 20 Marks<br>ESE: 60 Marks |

**Prerequisite: Computer Network**

**Companion Course, if any:** Program Elective Course 1 Lab (24P1507)

**Course Objectives:**

- To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.
- To develop students that can plan, implement, and monitor cyber security mechanisms to help ensure the protection of information technology assets.
- To develop graduates that can identify, analyze, and remediate computer security breaches

| Course Outcomes: On completion of the course, learner will be able to–  | BL |
|---|----|
| <b>CO1: Analyze</b> and evaluate the cyber security needs of an organization.   | 4  |
| <b>CO2: Determine</b> and analyze software vulnerabilities and security solutions to reduce the risk of exploitation. | 3  |
| <b>CO3: Analyze</b> logs to correlate events and identify patterns that indicate threats.                             | 4  |
| <b>CO4: Demonstrate cryptographic</b> methods ensure secure communication and data protection.                        | 3  |
| <b>CO5: Identify</b> and collect digital evidence in a forensically sound manner.                                     | 1  |
| <b>CO6: Apply</b> ethical and legal principles in the handling and investigation of digital evidence.                 | 3  |

**Course Contents**

| Unit I   | Overview of Cyber Security  | (08 Hrs.) |
|--|---|-----------|
| Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace. Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.                                     |   |           |
| Case Studies   | Discuss Cyber security in Financial Sector                                |           |
| Unit II  | Vulnerabilities and Access Control  | (08 Hrs.) |
| Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management. |   |           |
| Case Studies   | Discuss Vulnerabilities in E-Commerce - Securing Customer Data at ShopNow |           |
| Unit III   | Intrusion detection and Prevention  | (08 Hrs.) |

|   |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
|---|-----|-----|-----|---|-----|-----|-----|-----|-----|------|------|------|-----------|------|------|
| Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation. |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| Case Studies  |     |     |     | Intrusion Detection and Prevention in Financial Sector - Safeguarding Bank Data at Secure Bank. |     |     |     |     |     |      |      |      |           |      |      |
| Unit IV   |     |     |     | Cryptography  |     |     |     |     |     |      |      |      | (08 Hrs.) |      |      |
| Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.              |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| Case Studies  |     |     |     | Discuss Cryptography in Secure Cloud Storage - Protecting Data at Cloud Secure                  |     |     |     |     |     |      |      |      |           |      |      |
| Unit V  |     |     |     | Cyber Forensic  |     |     |     |     |     |      |      |      | (08 Hrs.) |      |      |
| Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.  |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| Case Studies  |     |     |     | Discuss Cyber Forensics in Intellectual Property Theft  |     |     |     |     |     |      |      |      |           |      |      |
| Learning Resources  |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| Text Books:   |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| 1. The Hacker Playbook: Practical Guide To Penetration Testing – @Peter Kim.  |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| 2. Applied Network Security Monitoring: Collection, Detection, and Analysis – @Chris Sanders, @Jason Smith.   |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| Reference Books:  |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| 1. Network Security Through Data Analysis: Building Situational Awareness – Michael Collins.  |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| e-Books: <web links>  |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| 1. <a href="https://heimdalsecurity.com/pdf/cyber_security_for_beginners_ebook.pdf">https://heimdalsecurity.com/pdf/cyber_security_for_beginners_ebook.pdf</a>  |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| 2. <a href="http://larose.staff.ub.ac.id/files/2011/12/Cyber-Criminology-Exploring-Internet-Crimes-and-Criminal-Behavior.pdf">http://larose.staff.ub.ac.id/files/2011/12/Cyber-Criminology-Exploring-Internet-Crimes-and-Criminal-Behavior.pdf</a>  |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| 3. <a href="http://docshare04.docshare.tips/files/21900/219006870.pdf">http://docshare04.docshare.tips/files/21900/219006870.pdf</a>  |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| MOOC Courses: <web links>   |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| 1. <a href="https://swayam.gov.in/nd2_cec20_cs15/preview">https://swayam.gov.in/nd2_cec20_cs15/preview</a>  |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| The CO-PO Mapping Matrix  |     |     |     |   |     |     |     |     |     |      |      |      |           |      |      |
| CO\PO   | 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    | -    | 2    | -         | -    | 3    |
| CO3   | -   | -   | -   | -   | -   | 3   | 3   | -   | -   | 2    | -    | 2    | -         | -    | 3    |
| CO4   | 1   | 1   | 3   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 3         | -    | 2    |
| CO5   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 3         | -    | 2    |
| CO6   | -   | -   | -   | -   | -   | 3   | -   | -   | -   | -    | -    | -    | 3         | 3    | 3    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application) 2024-25**  
**First Year MCA (FYMCA)**  
**Program Elective Course 1**

**24P1505-C: Operation Research**

| Teaching Scheme   | Credit | Examination Head: TH                                    |
|-------------------|--------|---|
|                   |        | Examination Scheme & Marks                              |
| TH: 04 Hours/Week | 04     | ISE:<br>CAT: 20 Marks<br>CCE: 20 Marks<br>ESE: 60 Marks |

**Companion Course, if any: Program Elective Course 1 Lab (24P1507)**

**Course Objectives:**

- To use quantitative methods and techniques for effective decisions-making
- Model formulation and applications that are used in solving business decision problems.
- To make better organizational and operational decisions
- Introduces the concepts of linear programming modeling and its solution techniques
- Explores the mathematical properties of general linear programming problems
- To solve and analyze real-world business problems

| Course Outcomes: On completion of the course, learner will be able to–   | BL |
|--|----|
| <b>CO1: Apply</b> foundational concepts of OR such as optimization, linear programming, and decision analysis to solve practical problems in a variety of sectors. | 3  |
| <b>CO2: Apply</b> the transportation model to real-world scenarios such as supply chain optimization.  | 3  |
| <b>CO3: Gain</b> knowledge of drawing project networks for quantitative analysis of projects   | 2  |
| <b>CO4: Apply</b> appropriate technique to analyze a project with an objective to optimize resources.  | 3  |
| <b>CO5: Understand</b> the characteristics of different types of decision-making environments and the appropriate decision-making approaches.                      | 3  |
| <b>CO6: Develop</b> simulation techniques to evaluate complex scenarios and make informed decisions.   | 5  |

**Course Contents**

| Unit I  | Introduction to Linear Programming                               | (08Hrs.) |
|---|--|----------|
| Construction of the LP model, Linear Programming -Graphical method, graphical solution methods of Linear Programming problems, Simplex method, Phase II in simplex method Primal and Dual Simplex Method, Big-M Method, Duality and Sensitivity Analysis  |  |          |
| <b>Case Studies (if any)</b>  | Linear Programming for Optimizing Crop Production in Agriculture |          |
| Unit II   | Transportation Model and its Variants                            | (08Hrs.) |
| Transportation Algorithm, Examples on Transportation Algorithm, Finding basic feasible solutions – Northwest corner rule, The Least cost method and Vogel's approximation method. Assignment Model, Examples on Assignment Model, The Transshipment Model, Examples on Transshipment Model  |  |          |
| <b>Case Studies (if any)</b>  | Discuss and study Assignment Model for Employee Shift Scheduling |          |
| Unit III  | CPM & PERT   | (08Hrs.) |
| Basic difference between CPM & PERT, Arrow Networks, Time estimates, earliest completion time, Latest allowable occurrence time, Forward Pass Computation, Backward Pass Computation, Representation in tabular form, Critical Path, Probability of meeting the scheduled date of completion Various floats for activities, Critical Path updating projects, Selection of schedule based on Cost analysis Crashing the network Sequencing models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines |  |          |

|  |   |          |
|--|---|----------|
| Case Studies (if any)  | Discuss CPM: Construction of a New Office Building and PERT - Launch of a New Product |          |
| Unit IV  | Network Models  | (08Hrs.) |
| Network Models: Scope of Network Applications –Network definition, Minimum Spanning Tree Algorithm, Examples on Minimum Spanning Tree Algorithm, Shortest Route Problem, Maximal flow model, Minimum cost capacitated flow problem, Goal Programming Algorithms      |   |          |
| Case Studies (if any)  | Optimize Supply Chain Distribution using Network Model                                |          |
| Unit V   | Decision Analysis   | (08Hrs.) |
| Decision making under certainty, Decision – making under risk, Decision under uncertainty. Games Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points. |   |          |
| Case Studies (if any)  | Discuss Decision Analysis in Healthcare: Choosing Treatment Option                    |          |
| Learning Resources   |   |          |
| Text Books:  |   |          |
| 1. P. Sankara Iyer, "Operations Research", Tata McGraw-Hill, 2008.   |   |          |
| 2. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.  |   |          |
| 3. Taha, Hamdy, Operations Research, 7th edition, (USA: Macmillan Publishing Company), 2003  |   |          |
| Reference Books:   |   |          |
| 1. J K Sharma., "Operations Research Theory & Applications , 3e", Macmillan India Ltd, 2007.   |   |          |
| 2. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.  |   |          |
| e-Books: <web links>   |   |          |
| 1.https://www.bbau.ac.in/dept/UIET/EME-601%20Operation%20Research.pdf  |   |          |
| MOOC Courses: <web links>  |   |          |
| 1. <a href="https://onlinecourses.nptel.ac.in/noc19_ma29/preview">https://onlinecourses.nptel.ac.in/noc19_ma29/preview</a>   |   |          |
| 2.https://onlinecourses.swayam2.ac.in/cec20_ma10/preview   |   |          |
| The CO-PO Mapping Matrix   |   |          |

| CO\PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b> | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | -   | -    | 3    | -    | 3    | 3    | 3    |
| <b>CO2</b> | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | -   | -    | 3    | -    | 3    | 3    | 3    |
| <b>CO3</b> | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | -   | -    | 3    | -    | 3    | 3    | 3    |
| <b>CO4</b> | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | -   | -    | 3    | -    | 3    | 3    | 3    |
| <b>CO5</b> | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | -   | -    | 3    | -    | 3    | 3    | 3    |
| <b>CO6</b> | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | 3   | 3    | 3    | 3    | 3    | 3    | 3    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application) 2024-25**  
**First Year MCA (FYMCA)**  
**Program Elective Course 1**

**24P1505-D: Database System and SQL**

| Teaching Scheme   | Credit | Examination Head: TH  |
|-------------------|--------|---|
|                   |        | Examination Scheme & Marks  |
| TH: 04 Hours/Week | 04     | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |

**Companion Course, if any: Program Elective Course 1 Lab (24P1507)**

**Course Objectives:**

- To understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation.
- To provide a strong formal foundation in database concepts, technology and practice.
- To give systematic database design approaches covering conceptual design, logical design and an overview of physical design.
- Be familiar with the basic issues of transaction processing and concurrency control.
- To learn and understand various Database Architectures and Applications.

| Course Outcomes: On completion of the course, learner will be able to–                                   | BL |
|--|----|
| <b>CO1: Design</b> E-R Model for given requirements and convert the same into database tables.           | 5  |
| <b>CO2: Implement</b> data integrity constraints to ensure accurate and reliable data.                   | 3  |
| <b>CO3: Create</b> and use stored procedures, functions, and packages for reusable business logic.       | 5  |
| <b>CO4: Identify</b> and apply different normal forms to design efficient databases.                     | 1  |
| <b>CO5: Analyze</b> transaction states and manage concurrency control to avoid deadlocks.                | 4  |
| <b>CO6: Analyze</b> and adjust existing database structures to improve performance and reduce anomalies. | 4  |

**Course Contents**

| Unit I   | Introduction to Database Management Systems         | (08 Hrs.) |
|--|---|-----------|
| Introduction to Database Management Systems, Purpose of Database Systems, Database-System Applications, View of Data, Database Languages, Database System Structure, Data Models, Database Design and ER Model: Entity, Attributes, Relationships, Constraints, Keys, Design Process, Entity Relationship Model, ER Diagram, Extended E-R Features, converting E-R & EER diagram into tables.  |   |           |
| Case Studies   | E-R Diagram for University Course Management System |           |
| Unit II  | SQL   | (08 Hrs.) |
| SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, SQL Operators, Tables: Creating, Modifying, Deleting, Database Modification using SQL Insert, Update and Delete Queries. Views, Indexes, SQL, Set Operations, Joins, Ordering of Tuples, Aggregate Functions, Nested Queries, Null values, where clause, group by clause. Entity integrity, Referential integrity. |   |           |
| Case Studies   | SQL Data Types in an E-Commerce System              |           |
| Unit III   | PL/SQL  | (08 Hrs.) |



PL/SQL: Concept of Stored Procedures & Functions, Cursors, Triggers, Assertions, roles and privileges, Embedded SQL, Dynamic SQL.

|                     |                                       |
|---------------------|---------------------------------------|
| <b>Case Studies</b> | Managing Employee and Department Data |
|---------------------|---------------------------------------|

|                |   |                  |
|----------------|---|------------------|
| <b>Unit IV</b> | <b>Relational Database Design and Normalization</b> | <b>(08 Hrs.)</b> |
|----------------|---|------------------|

Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Normalization, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Algorithms for Decomposition, 2NF, 3NF, BCNF. Basic concept of a Transaction, Transaction Management, ACID Properties, Concept of Schedule, Serial Schedule, Concurrency Control: Need, Locking Methods, Deadlocks, Time stamping Methods.

|                     |   |
|---------------------|---|
| <b>Case Studies</b> | Relational Database Design and Normalization for an E-Commerce Platform |
|---------------------|---|

|               |  |                  |
|---------------|--|------------------|
| <b>Unit V</b> | <b>Transaction Management and Query Processing</b> | <b>(08 Hrs.)</b> |
|---------------|--|------------------|

Introduction to Database Architectures: Multi-user DBMS Architectures, Parallel Databases: Speedup and Scale up, Architectures of Parallel Databases. Distributed Databases: Architecture of Distributed Databases, Distributed Database Design, Distributed Transaction: Basics, Failure modes, Commit Protocols, Introduction to NoSQL Database, Types and examples of NoSQL

|                     |  |
|---------------------|--|
| <b>Case Studies</b> | Transaction Management and Query Processing for an Online Reservation System |
|---------------------|--|

### Learning Resources

#### Text Books:

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0-07-120413-X, 6th edition
2. Connally T, Begg C., "Database Systems", Pearson Education, ISBN 81-7808-861-4

#### Reference Books:

1. C J Date, —An Introduction to Database Systems, Addison-Wesley, ISBN: 0201144719
2. S.K.Singh, —Database Systems : Concepts, Design and Application, Pearson, Education, ISBN 978-81-317-6092-5
3. Pramod J. Sadalage and Martin Fowler, —NoSQL Distilled, Addison Wesley, ISBN10: 0321826620, ISBN-13: 978-0321826626

#### e-Books:

1. <http://www.freebookcentre.net/database-books-download/Introduction-to-Database-Systems.html>

#### MOOC Courses:

1. <https://www.coursera.org/courses?query=database>
2. <https://cs.stanford.edu/people/widom/DB-mooc.html>

### The CO-PO Mapping Matrix

| CO\PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b> | -   | -   | 3   | -   | -   | -   | 3   | 3   | -   | -    | -    | -    | 3    | 2    | 3    |
| <b>CO2</b> | -   | -   | 3   | -   | -   | -   | 3   | 3   | -   | -    | -    | -    | 3    | 3    | 3    |
| <b>CO3</b> | 3   | 3   | 3   | 3   | 3   | -   | 2   | -   | -   | -    | -    | -    | 3    | 3    | 3    |
| <b>CO4</b> | 3   | 3   | 3   | 3   | -   | -   | -   | -   | -   | -    | -    | -    | 3    | 3    | 3    |
| <b>CO5</b> | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | 2   | -    | -    | -    | 3    | 3    | 3    |
| <b>CO6</b> | 2   | 3   | 3   | 3   | 3   | -   | -   | -   | 2   | -    | -    | -    | 3    | 3    | 3    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application) 2024-25**  
**First Year MCA (FYMCA)**

**24P1506: Software Lab I**

| Teaching Scheme   | Credit | Examination Head: PR           |
|-------------------|--------|--------------------------------|
|                   |        | Examination Scheme & Marks     |
| PR: 04 Hours/Week | 02     | ISE: 20 Marks<br>ESE: 30 Marks |

**Companion Course, if any: Python Programming(24P1503), Software Testing and Quality Assurance(24P1502)**

**Course Objectives:**

- To develop Proficiency in Python Programming Fundamentals.
- To define structure and components of a python program
- To develop a strong grasp of Python data structures by writing programs that manipulate tuples and dictionaries.
- To learn to discuss various software testing issues and solutions in software unit test, ingress, regression and system testing.
- To learn how to plan a test project, design test cases and generate a report.

| Course Outcomes: On completion of the course, learner will be able to–   | BL |
|--|----|
| <b>CO1: Demonstrate</b> proficiency in utilizing programming tools, Python integrated development environments (IDEs), effectively navigate and utilize the features provided by these tools to write program codes.   | 3  |
| <b>CO2: Demonstrate</b> proficiency in using statements and expressions functions, manipulate and utilize strings, classes and objects to implement effective code with conditional branching in Python programs.  | 3  |
| <b>CO3: Create</b> web applications using Python frameworks and understand client-server interactions  | 5  |
| <b>CO4: Analyze</b> testing results and effectively communicate findings to stakeholders.  | 4  |
| <b>CO5: Contribute</b> to continuous testing initiatives within an Agile or DevOps environment.  | 3  |
| <b>CO6:</b> Apply theoretical knowledge to real-world scenarios by engaging in experiential learning activities such as high-end equipment demonstrations, participating in industry visits, and organizing or participating in technical events so as to imbibe problem-solving skills, foster innovation, and build professional competencies necessary for successful careers in engineering. | 3  |

**Guidelines for Instructor's Manual**

The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), copy of curriculum, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

**Guidelines for Student's Laboratory Journal**



The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory-Concept in brief, algorithm, flowchart, Design, test cases, conclusion/analysis. Program codes with sample output of all performed assignments are to be submitted as soft copy. As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at the Laboratory.

### **Guidelines for Laboratory /Term Work Assessment**

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of students. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weight age. Suggested parameters for overall assessment as well as each lab assignment assessment include-timely completion, performance, innovation, efficient codes, punctuality and neatness.

### **Guidelines for Laboratory Conduction**

List of laboratory assignments is provided below for reference. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. It is appreciated if the assignments are based on real world problems/applications. Encourage students for appropriate use of coding style, proper indentation and comments. Use of open source software and recent version is to be encouraged. In addition to these, the instructor may assign one real life application in the form of a mini-project based on the concepts learned. Instructor may also set one assignment or mini-project that is suitable to a respective branch beyond the scope of syllabus

### **Suggested List of Laboratory Experiments/Assignments (Instructor may design a newer one)**

### **Software Lab I(24P1506)**

#### **Group A : Python Programming (24P1503)**

| <b>Sr. No.</b> | <b>Experiments/Assignments</b>   | <b>CO</b>          |
|----------------|--|--------------------|
| <b>1</b>       | Write a Python program to check whether an input number is an Armstrong number or not. An Armstrong number is an integer with three digits such that the sum of the cubes of its digits is equal to the number itself. | CO1, CO2, CO3, CO6 |
| <b>2</b>       | Write a Python program to accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number e) prime factors                                   | CO1, CO2, CO3, CO6 |
| <b>3</b>       | Write a program to compute the smallest divisor and Greatest Common Divisor of two numbers.  | CO1, CO2, CO3, CO6 |
| <b>4</b>       | Write a python program to generate Fibonacci series.   | CO1, CO2, CO3, CO6 |
| <b>5</b>       | Write a python program to find factorial of a number Using recursion.  | CO1, CO2, CO3, CO6 |
| <b>6</b>       | Implement Function with concept of call by reference.  | CO1, CO2, CO3, CO6 |
| <b>7</b>       | Write a program to demonstrate working with tuple in python  | CO1, CO2, CO3, CO6 |
| <b>8</b>       | Write a python program to sum all the items in a dictionary.   | CO1, CO2, CO3, CO6 |
| <b>9</b>       | Implement tower of honoi.  | CO1, CO2, CO3, CO6 |
| <b>10</b>      | Create class STORE to keep track of Products (Product Code, Name and price). Display menu of all products to user. Generate appropriate bill.  | CO1, CO2, CO3, CO6 |

|    |  |                    |
|----|--|--------------------|
| 11 | Create class EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary). Define function members to compute a)total number of employees in an organization b)count of male and female employee c) Employee with salary more than 10,000 d) Employee with designation “Asst Manager”. | CO1, CO2, CO3, CO6 |
|----|--|--------------------|

**Group A :Software Testing and Quality Assurance(24P1502)**

| Sr. No. | Experiments/Assignments  | CO          |
|---------|--|-------------|
| 1       | Study of Test Director Tools.  | CO4,CO5,CO6 |
| 2       | Prepare test plan for an identified Mobile Application   | CO4,CO5,CO6 |
| 3       | Design test cases for any E-Commerce website   | CO4,CO5,CO6 |
| 4       | Manual Testing a) Write black box test cases for an application using Test Director tool. b)Perform white box testing – Cyclomatic complexity, data flow testing, control flow testing | CO4,CO5,CO6 |
| 5       | Automated Testing Perform Black Box testing using automated testing tool on an application. Testing Points to be covered – data driven wizard, parameterization, exception handling    | CO4,CO5,CO6 |

**Short Term Project**

**Learning Resources:**

**Textbooks:**

1. Chun, J Wesley, Core Python Programming, Second Edition, Pearson, 2007 Reprint 2010
2. Kenneth A. Lambert, The Fundamentals of Python: First Programs, Cengage Learning, ISBN:978-1111822705
3. Gowrishankar S, Veena A, “Introduction to Python Programming”, 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-081539437
4. Tamres L, “Introducing Software Testing”, Pearson Education, 2007.
5. Mathur A.P, “Fundamentals of Software Testing”, Pearson Education, 2008.
6. .Software Automation Testing Tools for Beginners, Rahul Shende, Shroff Publishers and Distributors, 2012
7. Barry, Paul, Head First Python, 2nd Edition, O Rielly, 2010
8. Lutz, Mark, Learning Python, 4th Edition, O Rielly, 2009

**The CO-PO Mapping Matrix**

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1   | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | -   | -    | 3    | -    | 3    | 3    | 3    |
| CO2   | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | -   | -    | 3    | -    | 3    | 3    | 3    |
| CO3   | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | -   | -    | 3    | -    | 3    | 3    | 3    |
| CO4   | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | -   | -    | 3    | -    | 3    | 3    | 3    |
| CO5   | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | -   | -    | 3    | -    | 3    | 3    | 3    |
| CO6   | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | 3   | 3    | 3    | 3    | 3    | 3    | 3    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application) 2024-25**  
**First Year MCA (FYMCA)**

**24P1507: Program Elective Course 1 Lab**

| Teaching Scheme   | Credit | Examination Head: PR           |
|-------------------|--------|--------------------------------|
|                   |        | Examination Scheme & Marks     |
| PR: 02 Hours/Week | 01     | ISE: 20 Marks<br>ESE: 30 Marks |

**Companion Course, if any: Program Elective Course 1(24P1505)**

**Course Objectives:**

- To install and configure Unity and Visual Studio for VR development.
- To develop the ability to write Python programs to sniff and analyze packets on local networks.
- To understand cyber security by implementing and analyzing the effects of various network-based attacks using Python scripts.
- To implement Linear Programming Problems (LPP) using Python and SciPy/PuLP.
- To implement various SQL Operations using (DDL, DML) commands.

| Course Outcomes: On completion of the course, learner will be able to–   | BL |
|--|----|
| <b>CO1: Create</b> interactive VR experiences using industry-standard development tools.   | 5  |
| <b>CO2: Conduct</b> penetration tests and vulnerability assessments to evaluate the security of systems.   | 3  |
| <b>CO3: Develop</b> and solve mathematical models for operational problems using optimization software.  | 5  |
| <b>CO4: Design</b> and optimize complex SQL queries to retrieve and manipulate data efficiently.   | 5  |
| <b>CO5: Collaborate</b> on group projects, demonstrating effective communication and project management skills in a database context.  | 3  |
| <b>CO6:</b> Apply theoretical knowledge to real-world scenarios by engaging in experiential learning activities such as high-end equipment demonstrations, participating in industry visits, and organizing or participating in technical events so as to imbibe problem-solving skills, foster innovation, and build professional competencies necessary for successful careers in engineering. | 3  |

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### **Suggested List of Laboratory Experiments/Assignments (Instructor may design a newer one)**

#### **Program Elective Course 1 Lab(24P1507)**

#### **Suggested List of Laboratory Experiments/Assignments**

#### **Augmented Reality and Virtual Reality(24P1505-A)**

| <b>Sr. No.</b> | <b>Experiments/Assignments</b>   | <b>CO</b> |
|----------------|--|-----------|
| 1.             | Installation of Unity and Visual Studio, setting up Unity for VR development, understanding documentation of the same.   | CO1, CO6  |
| 2.             | Demonstration of the working of HTC Vive, Google Cardboard, Google Daydream and Samsung gear VR.   | CO1, CO6  |
| 3.             | Develop a scene in Unity that includes: a cube, plane and sphere, apply transformations on the 3 game objects.   | CO1, CO6  |
| 4.             | Develop a scene in Unity that includes: a video and audio source.  | CO1, CO6  |
| 5.             | Develop a scene in Unity that includes a sphere and plane. Apply Rigid body component, material and Box collider to the game Objects. Write a program to grab and throw the sphere using VR controller.                          | CO1, CO6  |
| 6.             | Develop a simple UI (User interface) menu with images, canvas, sprites and button. Write a program to interact with UI menu through VR trigger button such that on each successful trigger interaction display a score on scene. | CO1, CO6  |

#### **Cyber Security(24P1505-B)**

| <b>Sr. No.</b> | <b>Experiments/Assignments</b>   | <b>CO</b> |
|----------------|--|-----------|
| 1.             | Write a program to sniff packet sent over the local network and analyze it.  | CO2,CO6   |
| 2.             | Create an attack using python script and implement attack and analyze the effect of attack. a) DDOS Attacks b) IP spoofing c) DNS Attack | CO2,CO6   |
| 3.             | Write a program in python script for Spam Mail Detection (Spam Filtering Implementation).  | CO2,CO6   |
| 4.             | Add proxy server as an extension in Google chrome and check the IP address before and after changing the proxy.                          | CO2,CO6   |
| 5.             | Study of network authentication protocol.  | CO2,CO6   |
| 6.             | Design a Case study and <b>Implement</b> cryptographic techniques to secure data transmission and storage.                               | CO2,CO6   |

#### **Operation Research(24P1505-C)**

| Sr. No. | Experiments/Assignments  | CO      |
|---------|--|---------|
| 1.      | Implement LPP in Python using SciPy and PuLP package or C or C++ | CO3,CO6 |
| 2.      | Implement transportation model in Python/C/C++/Java              | CO3,CO6 |
| 3.      | Implement travelling salesman problem in Python/C/C++/Java       | CO3,CO6 |
| 4.      | Implement minimum spanning tree                                  | CO3,CO6 |
| 5.      | Implement critical path of a given network                       | CO3,CO6 |
| 6.      | Implement Goal programming                                       | CO3,CO6 |

### Database System and SQL(24P1505-D)

| Sr. No. | Experiments/Assignments   | CO          |
|---------|---|-------------|
| 1.      | Implementation of DDL commands (Create, Alter& Drop) of SQL with suitable examples. Also implementation of DML commands (Insert, Update, & Delete) of SQL | CO4,CO5,CO6 |
| 2.      | Implementation of Different types of Functions and implementation of sub queries.   | CO4,CO5,CO6 |
| 3.      | Implementation of PL/SQL Cursor   | CO4,CO5,CO6 |
| 4.      | Implementation of PL/SQL Trigger  | CO4,CO5,CO6 |
| 5.      | Implementation of SQL function  | CO4,CO5,CO6 |
| 6.      | Implementation of SQL procedure   |             |

### Learning Resources:

#### Textbooks:

- 1 William R Sherman and Alan B Craig, "Understanding Virtual Reality: Interface, Application and Design", (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San
2. Alan B Craig, "Understanding Augmented Reality, Concepts and Applications", Morgan Kaufmann Publishers, ISBN:978-0240824086
3. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA. ISBN 978-81-265-2179-1.

### The CO-PO Mapping Matrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1   | -   | -   | 3   | -   | 3   | -   | 2   | -   | -   | -    | -    | -    | -    | 3    | 3    |
| CO2   | -   | -   | 2   | 2   | 3   | 3   | -   | -   | -   | 2    | -    | -    | -    | 3    | 3    |
| CO3   | 3   | 3   | 3   | 3   | -   | -   | 2   | -   | -   | -    | -    | -    | 3    | 3    | 3    |
| CO4   | -   | -   | -   | 3   | 3   | -   | -   | -   | -   | -    | -    | -    | 3    | 3    | 3    |
| CO5   | -   | 3   | 3   | 3   | 3   | -   | -   | 3   | 2   | -    | 3    | -    | 3    | 3    | 3    |
| CO6   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3    | 3    | 3    | 3    | 3    | 3    |

**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application) 2024-25**  
**First Year MCA (FYMCA)**



**24P1508: Study of Indian Constitution**

| Teaching Scheme   | Credit | Examination Head: SEMINAR I     |
|-------------------|--------|---------------------------------|
|                   |        | Examination Scheme & Marks      |
| TUT: 01 Hour/Week | 01     | ISE : 20 Marks<br>ESE: 30 Marks |

**Prerequisite:** Any graduate

**Course Objectives:**

- To realize the significance of the constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
- To identify the importance of fundamental rights as well as fundamental duties.
- To understand the functioning of Union, State and Local Governments in the Indian federal system.
- To learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.

| Course Outcomes: On completion of the course, learner will be able to–  | BL |
|---|----|
| <b>CO1: Apply</b> knowledge of the historical background, understand and explain the significance of Indian Constitution as the fundamental law of the land.  | 3  |
| <b>CO2: Analyze</b> his fundamental rights in proper sense at the same time identifies his Responsibilities in national building.   | 4  |
| <b>CO3: Analyze</b> the Indian political system, the powers and functions of the Union, State and Local Governments in detail   | 4  |
| <b>CO4: Understand</b> Electoral Process, Emergency provisions and Amendment procedure  | 3  |
| <b>CO5: Comprehend</b> the roles, powers, and functions of the Union executive, Union Legislature, and Union judiciary, with a focus on parliamentary procedures and the Supreme Court.               | 3  |
| <b>CO6: Discover</b> the legislative, administrative, and financial relations between the Union and State governments, including provisions for emergency, trade, and amendments to the Constitution. | 3  |

**Course Contents**

| Unit I   | Introduction to Constitution | (05 Hrs.) |
|--|------------------------------|-----------|
| Meaning and importance of the Constitution, salient features of Indian Constitution. Preamble of the Constitution. Fundamental rights-meaning and limitations. Directive principles of state policy and Fundamental duties -their enforcement and their relevance. |                              |           |
| Unit II  | Union Government             | (05 Hrs.) |
| Union Executive- President, Vice-president, Prime Minister, Council of Ministers. Union Legislature-Parliament and Parliamentary proceedings. Union Judiciary-Supreme Court of India –Composition and powers and functions.  |                              |           |
| Unit III   | State Governments            | (05 Hrs.) |
| State Executive- Governor, Chief Minister, Council of Ministers. State Legislature-State Legislative Assembly and State Legislative Council. State Judiciary-High court.   |                              |           |
| Unit IV  | Local Governments            | (05 Hrs.) |
| Local Government-Panchayat raj system with special reference to 73 rd and Urban Local Self Govt. with special reference to 74 <sup>th</sup> Amendment.   |                              |           |



| Unit V  | Election provisions, Emergency provisions, Amendment of the Constitution |     |     |     |     |     |     |     |     |      |      |      | (05 Hrs.) |      |      |
|---|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----------|------|------|
| Election Commission of India-composition, powers and functions and electoral process. Types of Emergency-grounds, procedure, duration and effects. Amendment of the constitution- meaning, Procedure and limitations. |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| Learning Resources  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| Text Books:   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 1. M.V.Pylee, “Introduction to the Constitution of India”,4 th Edition, Vikas publication,2005.   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 2. Durga Das Basu( DD Basu) , “Introduction to the constitution of edition, Prentice-Hall EEE, 2008. India”,(Student Edition),19 th   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| Reference Books:  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 1. Ministry of law and justice, The constitution of India, Govt of India, New Delhi, 2019.  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 2. JN Pandey, The constitutional law of India, Central Law agency, Allahabad, 51e, 2019   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| e-Books:  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 1. <a href="https://cdnbbsr.s3waas.gov.in/s380537a945c7aaa788ccfcdf1b99b5d8f/uploads/2023/05/2023050195.pdf">https://cdnbbsr.s3waas.gov.in/s380537a945c7aaa788ccfcdf1b99b5d8f/uploads/2023/05/2023050195.pdf</a>      |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| MOOC Courses:   |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| 1. <a href="https://www.youtube.com/watch?v=rUioc1ykCiA">https://www.youtube.com/watch?v=rUioc1ykCiA</a>  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| The CO-PO Mapping Matrix  |  |     |     |     |     |     |     |     |     |      |      |      |           |      |      |
| CO\PO   | PO1  | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1      | PSO2 | PSO3 |
| CO1   | -  | -   | 2   | -   | -   | -   | -   | -   | -   | 2    | -    | 2    | -         | -    | -    |
| CO2   | -  | -   | 2   | -   | -   | -   | -   | -   | -   | 2    | -    | 2    | -         | -    | -    |
| CO3   | -  | -   | -   | -   | -   | -   | -   | -   | -   | 2    | -    | 2    | -         | -    | -    |
| CO4   | -  | -   | -   | -   | -   | -   | -   | -   | -   | 2    | -    | 2    | -         | -    | -    |
| CO5   | -  | -   | -   | -   | -   | -   | -   | -   | -   | 2    | -    | 2    | -         | -    | -    |
| CO6   | -  | -   | -   | -   | -   | -   | -   | -   | -   | 2    | -    | 2    | -         | -    | -    |

# Semester II



| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>First Year MCA</b><br><b>24P1509 : Data Science</b>  |  |   |
|--|--|---|
| Teaching Scheme  | Credit   | Examination Head: TH  |
| TH: 04 Hours/Week  | 04   | TH Examination Scheme & Marks   |
|  |  | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |
| <b>Prerequisite: Statistical Foundation of Data Science</b>  |  |   |
| <b>Companion Course, if any:</b>   |  |   |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To develop the fundamental knowledge and understand concepts to become a data science professional.</li> <li>To Develop expertise in preparing and analyzing datasets using exploratory data analysis techniques</li> <li>To construct and evaluate simple and multiple regression models through visualization techniques</li> <li>To learn Data Preprocessing Techniques and machine learning algorithms required for Data Science.</li> <li>To visualize data and use for communicating stories from data</li> </ul> |  |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–  |  | <b>BL</b>   |
| <b>CO1: Explain</b> flow process for data science problems.  |  | <b>2</b>  |
| <b>CO2: Demonstrate</b> data preprocessing and warehouse.  |  | <b>3</b>  |
| <b>CO3: Build</b> and evaluate regression models using visualization technique and apply in-sample evaluation measures to enhance prediction and decision-making, and report the findings comprehensively.   |  | <b>4</b>  |
| <b>CO4: Assess</b> model performance using out-of-sample evaluation metrics, address overfitting and Underfitting, and optimize predictions through research techniques for model selection.   |  | <b>5</b>  |
| <b>CO5: Compare</b> appropriate data visualization methods for effective visualization of data.  |  | <b>6</b>  |
| <b>CO6: Evaluate</b> machine learning models using appropriate metrics   |  | <b>6</b>  |
| <b>Course Contents</b>   |  |   |
| Unit I   | Data Science Life Cycle  | (08 Hrs.)   |
| Application of Data Science, Data Science Life Cycle, What is Data, Types of Data ,Data Explosion, Data Collection, Methods: Data Cleaning, Data Integration, Data Transformation, Data Discretization, Importance of Data Science   |  |   |
| <b>Case Studies</b>  | Understand the phases of data life cycle with suitable example   |   |
| Unit II  | Data Preprocessing and Warehouse   | (08 Hrs.)   |
| What is Data Preprocessing, Need of Data Preprocessing, Data Preprocessing Techniques and Importance of Data Preprocessing? What is Data Warehouse, Need of Data Warehouse, Components and Types of Data Warehouse, Data Warehouse Tools, Advantages and Disadvantages of Data Warehouse, Applications of Data warehouse   |  |   |
| <b>Case Studies</b>  | Create academic performance dataset of students and perform data preprocessing using techniques of data cleaning and data transformation |   |
| Unit III   | Model Development  | (08 Hrs.)   |

Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.

|   |  |                  |
|---|--|------------------|
| <b>Case Studies</b>   | Study of prediction of Housing Prices            |                  |
| <b>Unit IV</b>  | <b>Model Evaluation</b>                          | <b>(08 Hrs.)</b> |
| Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.   |  |                  |
| <b>Case Studies</b>   | Loan Default Prediction Model                    |                  |
| <b>Unit V</b>   | <b>Data Visualization</b>                        | <b>(08 Hrs.)</b> |
| Introduction to Data visualization, Benefits of Data Visualization, Types of data visualization, Tools used in data visualization, Data visualization Techniques, Types of Graphs: Bar Graph, Stacked Bar Chart, Pie Chart, Doughnut Chart, Line Chart, Area Chart, Treemap chart, Heatmap, Waterfall Chart, Scatter Plot, Histogram, Box plot. |  |                  |
| <b>Case Studies</b>   | Use any dataset and plot 2D views of the dataset |                  |

### Learning Resources

#### Text Books:

1. Jeffrey S.Saltz,Jeffre M. Stanton, “An Introduction to Data Science”, Sage Publications,2018
2. Seema Acharya ,”Data Analytics using R “ , McGraw Hill, 2018
3. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly.

#### Reference Books:

1. Bharti Motwani, “Data Analytics with R”, Wiley 2019.
2. Hadley Wickham, “R for Data Science: Import, Tidy, Transform, Visualize, and ModelData”, First Edition,O'Reilly Media Publisher, ISBN: 9781491910399, 2017.

#### e-Books:

- An Introduction to Statistical Learning by Gareth James

<https://www.ime.unicamp.br/~dias/Intoduction%20to%20Statistical%20Learning.pdf>

- An introduction to data Science :

<https://docs.google.com/file/d/0B6iefdnF22XQeVZDSkxjZ0Z5VUE/edit?pli=1>

#### MOOC Courses:

- <https://nptel.ac.in/courses/106/106/106106179/>

### The CO-PO Mapping Matrix

| CO\PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b> | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | 1   | 1    | -    | 1    | -    | 3    | 2    |
| <b>CO2</b> | 3   | 3   | 3   | 2   | 2   | 1   | -   | -   | 1   | 1    | -    | 1    | 2    | 3    | 1    |
| <b>CO3</b> | 3   | 3   | 3   | 3   | 2   | -   | -   | -   | 2   | 3    | -    | 1    | 3    | 3    | 1    |
| <b>CO4</b> | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 1   | 2   | 3    | 3    | 1    | 3    | 3    | 1    |
| <b>CO5</b> | 2   | 2   | 2   | 1   | 3   | 2   | 1   | -   | 2   | 3    | 3    | 1    | 1    | 1    | 3    |
| <b>CO6</b> | 3   | 3   | 3   | 3   | 3   | 2   | -   | -   | 3   | 3    | 3    | 2    | 3    | 3    | 3    |



| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>First Year MCA</b><br><b>24P1510 : Java Programming</b>  |  |   |
|--|--|---|
| Teaching Scheme  | Credit   | Examination Head: TH  |
|  |  | Examination Scheme & Marks  |
| TH: 04 Hours/Week  | 04   | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |
| <b>Prerequisite:</b> Fundamental Programming Concepts  |  |   |
| <b>Companion Course, if any: Software Lab II(24P1513)</b>  |  |   |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To learn about the concepts and principles of java programming.</li> <li>To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.</li> <li>To develop applications using object oriented programming concepts of java.</li> <li>To develop GUI application using Swing and Applet programming.</li> </ul> |  |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–  |  | <b>BL</b>   |
| <b>CO1: Explain</b> the basic terminologies of Java language and statements.   |  | <b>2</b>  |
| <b>CO2: Analyze</b> problems and develop algorithms to solve them using Java.  |  | <b>4</b>  |
| <b>CO3: Sketch</b> the Java application by applying the programming constructs and features like Interface, Package and Exception Handling.  |  | <b>3</b>  |
| <b>CO4: Operate</b> robust programs by handling errors and exceptions using Java's exception handling mechanisms..   |  | <b>3</b>  |
| <b>CO5:Construct</b> the Java console base application based on multithreading, network programming  |  | <b>3</b>  |
| <b>CO6: Plan</b> with Java Collections, including lists, sets, maps, and queues, to manage and manipulate data.  |  | <b>5</b>  |
| Course Contents  |  |   |
| Unit I   | Introduction to Java Programming   | (08 Hrs.)   |
| History of java, Introduction to Java, Features of Java, Programming Concepts Identifiers, Keywords, Variables, Control Structure, Decision Making Statements, Arrays & Strings (String, String Buffer class) Object Oriented Concepts of Java Class & Objects, Encapsulation & Abstraction, Inheritance & Polymorphism, Java Input / Output Operations.   |  |   |
| <b>Case Studies</b>  | Demonstration of basic Java Programming with java program compilation and Execution. |   |
| Unit II  | Java Programming Constructs  | (08 Hrs.)   |
| Defining Class with data members and methods, Creating objects & accessing members of class, Access specifiers: Public, Private and Protected, Modifiers: Static, Final and Abstract, Object Initialization using Constructor, Types of constructors. Inheritance: Types of Inheritance, Polymorphism: Types of Polymorphism, Method overloading , Method overriding   |  |   |
| <b>Case Studies</b>  | Discuss Polymorphism in a Vehicle Management System                                  |   |
| Unit III   | Interface, Packages and Exception Handling   | (08 Hrs.)   |

Interface: Definition of Interface, Implementing an Interface, Abstract class. Package: Introduction, Creating Package, Importing Package, Package scope, Exception Handling: Introduction to Exception and Exception Handling, Types of Exception, Exception handling using try, catch and finally block, Use of throw and throws statements, User defined exception

**Case Studies** Discuss Exception Handling in a Banking Application

**Unit IV** **Java Input / Output & Multithreading** **(08 Hrs.)**

Java Input / Output: Java I/O package, IO class Hierarchy, Byte Stream and Character Stream classes, Buffered Reader and writer classes, Classes for file IO operations, Print Writer class, Multithreading in Java: Introduction to multithreading, Thread Life Cycle, Creating Thread using Thread class or Runnable Interface, Main Thread and Thread Properties, Creating multithreaded application, Thread Synchronization and Communication

**Case Studies** Discuss Log File Analyzer

**Unit V** **Java Collection Framework** **(08 Hrs.)**

Introduction to collection framework: Collection Interface, Classes and Iterator, Collection, Set, Sorted Set and List interface, Array List, Linked List, Hash Set, Tree Set classes, Map and Sorted Map interface, Hash Map and TreeMap classes

**Case Studies** Discuss Student Grade Management System

### Learning Resources

#### Text Books:

1. E. Balagurusamy, —Programming with Javall, TataMc-Graw Hill, 5 th Edition.
2. Sagayaraj, Denis, Karthick and Gajalakshmi, —Java Programming for Core and advanced learners, Universities Press (INDIA) Private Limited 2018.

#### Reference Books:

1. Java Complete Reference, Herbert Schildt, TMH
2. Programming with Java A Primer, E. Balagurusamy, TMH
3. Java 6 Programming Black Book , Kogent Solution Inc, dreamTech Pub
4. Core Java 2 Volume – I, Cay S Horstmann, Fary Cornell, Sun Microsystems Press

#### e-Books:

1. <http://www.w3schools.in/java-tutorial>

#### MOOC Courses:

1. <https://nptel.ac.in/courses/106105191/>
2. <https://moocfi.github.io/courses/2013/programming-part-1/>
3. <https://education.oracle.com/java-se-programming-i-mooc>

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1                      | 3   | 3   | 1   | -   | 1   | -   | -   | -   | -   | -    | -    | -    | -    | -    | 1    |
| CO2                      | 3   | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -    | -    | -    | -    | 2    | 2    |
| CO3                      | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | -   | -    | -    | -    | 1    | 2    | 3    |
| CO4                      | 3   | 3   | 3   | 1   | 3   | 2   | 2   | -   | -   | -    | -    | -    | -    | 1    | 2    |
| CO5                      | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | -   | -    | -    | 1    | 1    | 2    | 3    |
| CO6                      | 3   | 3   | 3   | 3   | 3   | -   | -   | -   | -   | -    | -    | -    | 3    | 3    | 3    |

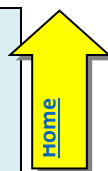
| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>First Year MCA</b><br><b>24P1511 : Web Technology</b>  |   |   |
|--|---|---|
| Teaching Scheme  | Credit  | Examination Head: TH<br>Examination Scheme & Marks                                  |
| TH: 04 Hours/Week  | 02  | <b>ISE:</b><br><b>CAT: 10 Marks</b><br><b>CCE: 10 Marks</b><br><b>ESE: 30 Marks</b> |
| <b>Prerequisite:</b> Students are expected to have a good understanding of Computer Network  |   |   |
| <b>Companion Course, if any: Software Lab II(24P1513)</b>  |   |   |
| <b>Course Objectives:</b><br>To learn the fundamentals of web essentials and markup languages<br>To learn the Client side technologies in web development<br>To study the Server side technologies in web development<br>To understand the web services and frameworks.  |   |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–  |   | <b>BL</b>   |
| <b>CO1: Implement</b> and analyze behavior of web pages using HTML, and CSS  |   | <b>3</b>  |
| <b>CO2: Analyze</b> current client-side web technologies   |   | <b>5</b>  |
| <b>CO3: Understand</b> the concepts of XML & AJAX.   |   | <b>5</b>  |
| <b>CO4: Apply</b> the server side technologies for web development.  |   | <b>3</b>  |
| <b>CO5: Create</b> effective web applications for business functionalities using PHP.  |   | <b>5</b>  |
| <b>CO6: Understand</b> the basic client-server model and how data is exchanged between clients (browsers) and servers.   |   | <b>2</b>  |
| Course Contents  |   |   |
| Unit I   | Introduction to Web Technologies                            | (08 Hrs.)   |
| Introduction to Web Technology, basic internet protocols, World Wide Web, HTTP Request message, HTTP response message, web clients, web servers, HTML5: structure of html document, HTML5 elements: headings, paragraphs, line break, colors & fonts, links, frames, lists, tables, images and forms, Difference between HTML and HTML5. CSS: Introduction to Style Sheet, Inserting CSS in an HTML page, CSS selectors. |   |   |
| Case Studies   | Design E-Commerce Website using HTML and using style sheets |   |
| Unit II  | Client Side Technologies: JavaScript                        | (08 Hrs.)   |
| JavaScript: Introduction to Scripting languages, Introduction to JavaScript (JS), JS Variables and Constants, JS Variable Scopes, JS Data Types, JS Functions, JS Array, JS Object, JS Events. DOM: Introduction to Document Object Model  |   |   |
| Case Studies   | Design Real-Time Chat Application                           |   |
| Unit III   | XML and AJAX  | (08 Hrs.)   |
| XML: Introduction to XML, Features and applications of XML, XML key component, XML DTD, XML Schema, elements, attributes, XML Namespaces, Transforming XML into XSLT. AJAX: Introduction to AJAX, Why AJAX, Call HTTP Methods Using AJAX, Data Sending, Data Receiving, AJAX Error Handling.   |   |   |
| Case Studies   | Design Weather Forecast Application                         |   |
| Unit IV  | Server-Side Technology: PHP                                 | (08 Hrs.)   |
| Introduction to PHP, uses of PHP, general syntactic characteristics, Primitives, PHP variables and operators, taking user inputs and generating outputs, control statements, arrays, functions, pattern matching, Dates and Times function, User Defined functions.  |   |   |
| Case Studies   | Design User Authentication System                           |   |

| Unit V   | Server-Side Technology: Advance PHP                      | (08 Hrs.) |
|--|--|-----------|
| Object oriented programming using PHP, PHP Form Handling, PHP Form Validation, File Handling in PHP, cookie and session, PHP File Upload, PHP File Open/Read, PHP File Create/Write operations |  |           |
| Case Studies   | Design E-Commerce Platform with Cart System and Checkout |           |

| Learning Resources   |  |
|--|--|
| <b>Text Books:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Jeffrey C.Jackson, "Web Technologies: A Computer Science Perspective", Second Edition, Pearson Education, 2007, ISBN 978-0131856035</li> <li>2. Robert W. Sebesta, "Programming the World Wide Web", 4th Edition, Pearson education, 2008</li> <li>3. HTML, DHTML, JavaScript, Perl &amp; CGI Ivan Bayross, BPB Pub, 3rd Ed.</li> <li>4. Ralph Moseley &amp; M. T. Savaliya, "Developing Web Applications", Wiley publications, ISBN 13 : 9788126538676</li> </ol> |  |
| <b>Reference Books:</b>  |  |
| <ol style="list-style-type: none"> <li>1. ACHYUT GODBOLE, ATUL K AHATE, "Web Technologies TCP/IP, Architecture, and Java Programming".</li> <li>2. H.M. Deitel, P.J. Deitel and A.B. Goldberg, "Internet &amp; World Wide Web How To Program", Third Edition, Pearson Education, 2006, ISBN 978-0131752429.</li> </ol>   |  |
| <b>e-Books:</b>  |  |
| <ul style="list-style-type: none"> <li>• <a href="https://www.w3.org/html/">https://www.w3.org/html/</a></li> <li>• HTML, The Complete Reference <a href="http://www.htmlref.com/">http://www.htmlref.com/</a></li> </ul>  |  |
| <b>MOOC Courses:</b>   |  |
| <ul style="list-style-type: none"> <li>• <a href="http://www.nptelvideos.in/2012/11/internet-technologies.html">http://www.nptelvideos.in/2012/11/internet-technologies.html</a></li> <li>• <a href="https://freevideolectures.com/course/2308/internet-technology/25">https://freevideolectures.com/course/2308/internet-technology/25</a></li> </ul>   |  |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1                      | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | 2   | 1    | -    | 1    | -    | 3    | 2    |
| CO2                      | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | 1   | 1    | -    | 1    | -    | 3    | 2    |
| CO3                      | 2   | 3   | 3   | 2   | 2   | -   | -   | -   | 2   | 1    | -    | 1    | 2    | 3    | 2    |
| CO4                      | 3   | 3   | 3   | 3   | 3   | 2   | -   | 2   | 2   | 3    | 1    | 1    | 3    | 3    | 2    |
| CO5                      | 3   | 3   | 3   | 3   | 3   | 2   | -   | 2   | 2   | 3    | 2    | 1    | 3    | 3    | 2    |
| CO6                      | 3   | 3   | 2   | 3   | 3   | 3   | -   | -   | 2   | 2    | 1    | -    | 3    | 2    | 3    |





| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>First Year MCA</b><br><b>Program Elective Course-2</b><br><b>24P1512-A : Quantum Computing</b>  |  |   |
|---|--|---|
| Teaching Scheme   | Credit   | Examination Head: TH  |
|   |  | Examination Scheme & Marks  |
| TH: 04 Hours/Week   | 04   | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |
| <b>Prerequisite:</b> Data Structures and Algorithms, Data Science and Big Data Analytics  |  |   |
| <b>Companion Course, if any:</b> Program Elective Course 2 Lab (24P1514)  |  |   |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To learn Quantum Mechanics Fundamentals</li> <li>To study Quantum Computing Models</li> <li>To study the implementation and applications of quantum algorithms</li> <li>To learn how to experiment with quantum systems and analyze experimental results.</li> </ul> |  |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–   |  | <b>BL</b>   |
| <b>CO1: Demonstrate</b> an understanding of the basic principles of quantum.  |  | <b>3</b>  |
| <b>CO2: Understand</b> and get exposure to mathematical foundation and quantum mechanics  |  | <b>2</b>  |
| <b>CO3: Recognize</b> and analyze the practical applications of quantum computing   |  | <b>2</b>  |
| <b>CO4: Design</b> and implement quantum algorithms using quantum programming languages   |  | <b>5</b>  |
| <b>CO5: Design</b> and solve examples of Quantum Fourier Transforms and their applications  |  | <b>5</b>  |
| <b>CO6: Understand</b> the principles and techniques of quantum error correction and fault-tolerant quantum computing.  |  | <b>2</b>  |
| Course Contents   |  |   |
| Unit I  | Introduction to Quantum Computing              | (08 Hrs.)   |
| Fundamental Concepts of Quantum computing: Introduction and Overview, Global Perspective, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum information and Quantum information processing.  |  |   |
| Case Studies  | Study of Superposition and Basic Quantum Gates |   |
| Unit II   | Mathematical foundation of Quantum Computing   | (08 Hrs.)   |
| Quantum Mechanics: Linear Algebra and Quantum mechanics, Postulates of Quantum mechanics, state space, evolution, Quantum measurement, distinguishing quantum states, projective measurements, POVM measurements, Phase, Composite systems, Global view and applications  |  |   |
| Case Studies  | Study of Quantum States and Superposition      |   |
| Unit III  | Building Blocks for Quantum Program            | (08 Hrs.)   |
| Quantum Computations: Quantum circuits, Quantum algorithms and qubit operations, Controlled operations, Principal deferred and Principal implicit Measurements, Universal Quantum Gates, Two level unitary gates, single qubit and CNOT , discrete set of universal operation   |  |   |
| Case Studies  | Entangling Two Qubits with the CNOT Gate       |   |
| Unit IV   | Quantum Fourier Transform and Applications     | (08 Hrs.)   |



Quantum Fourier Transform, Phase estimation performance and requirements, order finding application, factoring application, General applications of Quantum Fourier transform, period finding, discrete algorithms, Other Quantum Algorithms. \*Mapping of C

|   |   |                  |
|---|---|------------------|
| <b>Case Studies</b>   | Discuss Application of Quantum Fourier Transform in Shor's Algorithm  |                  |
| <b>Unit V</b>   | <b>Quantum Machine Learning</b>   | <b>(08 Hrs.)</b> |
| Quantum Machine Learning and Quantum AI, Quantum Neural Networks, Quantum Natural Language Understanding, Quantum Cryptography, Application Domains for Quantum Machine Learning: Chemistry/Material Science, Space Tech, Finance related Optimization Problems, Swarm Robotics, Cyber security |   |                  |
| <b>Case Studies</b>   | <ul style="list-style-type: none"> <li>Quantum Support Vector Machine (QSVM) to classify data points in a simple 2D space.</li> <li>Quantum k-means clustering algorithm to group a set of 2D data points into k clusters.</li> </ul> |                  |

### Learning Resources

#### Text Books:

1. Michael A. Nielsen, —Quantum Computation and Quantum Information, Cambridge University
2. Wittek, —Quantum Machine Learning (What Quantum Computing Means to Data Mining), Peter University of Borås, Sweden - Elsevier Publications
3. Andreas Winchert, —Principles of Quantum Artificial Intelligence, Instituto Superior Técnico - Universidade de Lisboa, Portugal - World Scientific Publishing, British Library Cataloguing-in-Publication Data

#### Reference Books:

1. Michael A. Nielsen, —Quantum Computation and Quantum Information, Cambridge University Press
2. Stephen Kan, —Metrics and Models in Software Quality Engineering, Pearson, ISBN-10: 0133988082; ISBN-13: 978-0133988086
2. David McMahon, —Quantum Computing Explained, Wiley

#### e-Books:

1. <http://mmrc.amss.cas.cn/tlb/201702/W020170224608149940643.pdf>
2. <http://mmrc.amss.cas.cn/tlb/201702/W020170224608150244118.pdf>

#### MOOC Courses:

1. [https://onlinecourses.nptel.ac.in/noc21\\_cs103/preview](https://onlinecourses.nptel.ac.in/noc21_cs103/preview)
2. <https://www.coursera.org/learn/introduction-to-quantum-information>

### The CO-PO Mapping Matrix

| CO\PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b> | 3   | 3   | 2   | 1   | 1   | -   | -   | -   | 2   | 1    | -    | 1    | 2    | 3    | 2    |
| <b>CO2</b> | 3   | 3   | 3   | 2   | 2   | 1   | -   | -   | 2   | 2    | -    | 1    | 3    | 3    | 2    |
| <b>CO3</b> | 2   | 3   | 3   | 2   | 2   | -   | -   | -   | 2   | 2    | -    | 2    | 3    | 2    | 3    |
| <b>CO4</b> | 3   | 3   | 3   | 3   | 3   | 2   | -   | -   | 3   | 3    | 2    | 1    | 3    | 3    | 2    |
| <b>CO5</b> | 3   | 3   | 3   | 3   | 3   | 2   | -   | -   | 2   | 3    | 1    | 1    | 3    | 3    | 2    |
| <b>CO6</b> | 3   | 3   | 3   | 3   | 3   | 3   | -   | -   | 3   | 3    | 2    | 1    | 3    | 3    | 2    |



| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>First Year MCA</b><br><b>Program Elective Course-2</b><br><b>24P1512-B : Cloud Computing</b>  |  |   |
|---|--|---|
| Teaching Scheme   | Credit   | Examination Head: TH  |
|   |  | Examination Scheme & Marks  |
| <b>TH: 04 Hours/Week</b>  | <b>04</b>  | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |
| <b>Prerequisite:</b> Basic of Computer Networks   |  |   |
| <b>Companion Course, if any:</b> Program Elective Course 2 Lab (24P1514)  |  |   |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To study fundamental concepts of cloud computing</li> <li>To learn various data storage methods on cloud</li> <li>To learn the application and security on cloud computing</li> <li>To study risk management in cloud computing</li> <li>To learn the application and security on cloud computing</li> </ul> |  |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–   |  | <b>BL</b>   |
| <b>CO1:Understand</b> the different Cloud Computing environment   |  | <b>2</b>  |
| <b>CO2:Use</b> appropriate data storage technique on Cloud, based on Cloud application  |  | <b>3</b>  |
| <b>CO3:Develop</b> and deploy applications on Cloud   |  | <b>5</b>  |
| <b>CO4:Apply</b> security in cloud applications   |  | <b>5</b>  |
| <b>CO5:Use</b> advance techniques in Cloud Computing  |  | <b>3</b>  |
| <b>CO6: Analyze</b> virtualization technology and install virtualization software   |  | <b>4</b>  |
| Course Contents   |  |   |
| Unit I  | Introduction to Cloud Computing                          | (08 Hrs.)   |
| Introduction, Importance of Cloud Computing, Characteristics, Pros and Cons of Cloud Computing, Trends in Computing, Cloud Service Models: SaaS, PaaS, IaaS, Storage. Cloud Architecture: Cloud Computing Logical Architecture, Cloud Computing Reference Model, Cloud System Architecture  |  |   |
| <b>Case Studies</b>   | Study of different Cloud deployment Computing Model      |   |
| Unit II   | Data Storage and Cloud Computing                         | (08 Hrs.)   |
| <b>Data Storage:</b> Introduction to Enterprise Data Storage, Direct Attached Storage, Storage Area Network, Network Attached Storage, Data Storage Management, File System, Cloud Data Stores, Using Grids for Data Storage. <b>Cloud Storage:</b> Data Management, Provisioning Cloud storage, Data Intensive Technologies for Cloud Computing.                             |  |   |
| <b>Case Studies</b>   | Study of Cloud Storage for a Growing E-commerce Platform |   |
| Unit III  | Cloud Platforms and Cloud Applications                   | (08 Hrs.)   |
| Amazon Web Services (AWS): Amazon Web Services and Components, Amazon Simple DB, Elastic Cloud Computing (EC2), Amazon Storage System, Amazon Database services (DynamoDB). Cloud Computing Applications: Healthcare: ECG Analysis in the Cloud, Geosciences: Satellite Image Processing, Business and Consumer Applications: CRM and ERP, Social Networking,                 |  |   |
| <b>Case Studies</b>   | Study of cloud-native applications                       |   |
| Unit IV   | Security in Cloud Computing                              | (08 Hrs.)   |

Risks in Cloud Computing: Risk Management, Types of Risks in Cloud Computing. Data Security in Cloud: Security Issues, Challenges, advantages, Disadvantages, Cloud Digital persona and Data security, Content Level Security. Cloud Security Services: Confidentiality, Integrity and Availability, Security Authorization Challenges in the Cloud, Secure Cloud Software Requirements, Secure Cloud Software Testing

|  |   |           |
|--|---|-----------|
| Case Studies   | <ul style="list-style-type: none"><li>Discuss Securing Customer Data in a Cloud-Based E-Commerce Platform</li><li>Cloud Security Tool: Acunetix.</li></ul>  |           |
| Unit V   | Advanced Techniques in Cloud Computing  | (08 Hrs.) |
| Future Trends in cloud Computing, Mobile Cloud, and Automatic Cloud Computing: Comet Cloud. Multimedia Cloud: IPTV, Energy Aware Cloud Computing, Jungle Computing, Distributed Cloud Computing Vs Edge Computing, Containers, Docker, and Kubernetes, Introduction to DevOps. |   |           |
| Case Studies   | <ul style="list-style-type: none"><li>Discuss server less computing for cost-effectiveness of a cloud architecture.</li><li>Explore the integration of serverless components with AWS S3, AWS Kinesis, and AWS DynamoDB for real-time storage and analysis.</li></ul> |           |

### Learning Resources

#### Text Books:

1. A. Srinivasan, J. Suresh, "Cloud Computing: A Practical Approach for Learning and Implementation", Pearson, ISBN: 978-81-317-7651-3
2. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, ISBN-13:978-1-25-902995-0

#### Reference Books:

1. James Bond, "The Enterprise Cloud", O'Reilly Media, Inc. ISBN: 9781491907627
2. Dr. Kris Jamsa, "Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more", Wiley Publications, ISBN: 978-0-470-97389-9
3. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", 2010, The McGraw-Hill.
4. Gautam Shrof, "ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications", Cambridge University Press, ISBN: 9780511778476

#### e-Books:

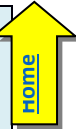
1. <https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTING-Principles-and-Paradigms.pdf>
2. <https://studytin.files.wordpress.com/2014/03/hand-book-of-cloud-computing.pdf>

#### MOOC Courses:

- [https://onlinecourses.nptel.ac.in/noc21\\_cs14/preview?](https://onlinecourses.nptel.ac.in/noc21_cs14/preview?)
- [https://onlinecourses.nptel.ac.in/noc21\\_cs15/preview?](https://onlinecourses.nptel.ac.in/noc21_cs15/preview?)

### The CO-PO Mapping Matrix

| CO\PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b> | 3   | 2   | 2   | 1   | -   | -   | -   | -   | 2   | 1    | -    | -    | 3    | 2    | 3    |
| <b>CO2</b> | 3   | 3   | 2   | 2   | -   | 2   | -   | -   | 2   | 2    | -    | 1    | 3    | 2    | 3    |
| <b>CO3</b> | 3   | 3   | 3   | 2   | 3   | 2   | -   | -   | 3   | 2    | 1    | 2    | 3    | 3    | 3    |
| <b>CO4</b> | 3   | 3   | 3   | 3   | 3   | 2   | -   | -   | 3   | 3    | 2    | 1    | 3    | 3    | 2    |
| <b>CO5</b> | 3   | 3   | 3   | 2   | 3   | 3   | -   | -   | 3   | 3    | 2    | 2    | 3    | 3    | 3    |
| <b>CO6</b> | 3   | 2   | 2   | 2   | 2   | 3   | -   | -   | 2   | 2    | 1    | 1    | 3    | 3    | 2    |

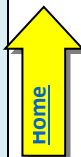


| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>First Year MCA</b><br><b>Program Elective Course-2</b><br><b>24P1512-C : Business Intelligence &amp; Analytics</b>  |   |   |
|---|---|---|
| Teaching Scheme   | Credit  | Examination Head: TH  |
|   |   | Examination Scheme & Marks  |
| TH: 04 Hours/Week   | 04  | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |
| <b>Prerequisite:</b> Database Management System, Data Science & Big data Analytics, Machine Learning  |   |   |
| <b>Companion Course, if any:</b> Digital Marketing, Program Elective Course 2 Lab (24P1514)   |   |   |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To introduce the concepts and components of Business Intelligence (BI)</li> <li>To evaluate the technologies that make up BI (data warehousing, OLAP)</li> <li>To identify the technological architecture of BI systems</li> <li>To explain different data preprocessing techniques</li> <li>To identify machine learning model as per business need</li> <li>To understand the BI applications in marketing, logistics, finance and telecommunication sector</li> </ul> |   |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–   |   | <b>BL</b>   |
| <b>CO1:Differentiate</b> the concepts of Decision Support System & Business Intelligence  |   | <b>4</b>  |
| <b>CO2: Apply</b> conceptual knowledge on how Business Intelligence is used in decision making process.   |   | <b>3</b>  |
| <b>CO3: Use</b> modeling concepts in Business Intelligence.   |   | <b>3</b>  |
| <b>CO4: Prepare</b> graphical reports.  |   | <b>5</b>  |
| <b>CO5: Implement</b> machine learning algorithms as per business needs.  |   | <b>3</b>  |
| <b>CO6: Identify</b> role of BI in marketing, logistics, and finance and telecommunication sector.  |   | <b>2</b>  |
| Course Contents   |   |   |
| Unit I  | Introduction to Decision Making and Business Intelligence   | (08 Hrs.)   |
| Decision support systems: Definition of system, Decision Support System, Development of a decision support system, the four stages of Simon's decision-making process<br>Business Intelligence: BI, its components & architecture, Futures of BI, setting up data for BI, data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence   |   |   |
| <b>Case Studies</b>   | Discuss how <b>BI tools</b> can improve sales performance and inventory management by providing real-time insights. |   |
| Unit II   | Modeling in BI  | (08 Hrs.)   |
| Models and Modeling in BI, Model Presentation, Model Building, Model Assessment and Quality of Models, Modeling using Logical Structures: Ontologies & Frames, Modeling using Graph Structures: Business Process Model and Notation (BPMN) & Petri Nets, Modeling using Probabilistic Structures, Modeling Using Analytical Structures. Models and Data: Data Generation, The Role of Time, Data Quality  |   |   |
| <b>Case Studies</b>   | Discuss Customer Segmentation Using Data Modeling   |   |
| Unit III  | Reporting Authoring   | (08 Hrs.)   |

|  |   |                  |
|--|---|------------------|
| What Is a Business Report, Components of Business Reporting Systems, Data and Information Visualization, Types of Charts and Graphs, Visual Analytics, Performance Dashboards, Business Performance Management, Closed Loop BPM Cycle, Performance Measurement, Key Performance Indicators, Balanced Scorecards BI Tools: Tableau, Qlik, power BI, Dundas BI, Sisense, Web focus |   |                  |
| <b>Case Studies</b>  | Demonstrate how <b>Power BI</b> can be used to create a unified dashboard for real-time sales analysis. |                  |
| <b>Unit IV</b>   | <b>Impact of Machine learning in Business Intelligence Process</b>                                      | <b>(08 Hrs.)</b> |
| Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression. Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models. Association Rule: Structure of Association Rule, Apriori Algorithm  |   |                  |
| <b>Case Studies</b>  | Discuss Sales Forecasting with Machine Learning in an E-Commerce Business                               |                  |
| <b>Unit V</b>  | <b>BI Applications</b>  | <b>(08 Hrs.)</b> |
| Data analytics, Business analytics, BI in inventory management system, BI and human resource management, BI Applications in CRM, BI Applications in Marketing, BI Applications in Logistics and Production, Role of BI in Finance, BI Applications in Banking, BI Applications in Telecommunications, BI in salesforce management  |   |                  |
| <b>Case Studies</b>  | Demonstrate how BI applications can improve <b>financial performance analysis</b> .                     |                  |

| Learning Resources   |  |
|--|--|
| <b>Text Books:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Fundamental of Business Intelligence, Grossmann W, Rinderle-Ma, Springer,2015</li> <li>2. R. Sharda, D. Delen, &amp; E. Turban, Business Intelligence and Analytics. Systems for Decision Support, 10th Edition. Pearson/Prentice Hall, 2015</li> </ol>  |  |
| <b>Reference Books:</b>  |  |
| <ol style="list-style-type: none"> <li>1. Paulraj Ponnian, —Data Warehousing Fundamentals, John Wiley.</li> <li>2. Introduction to business Intelligence and data warehousing, IBM, PHI</li> <li>3. Business Intelligence: Data Mining and Optimization for Decision Making, Carlo Vercellis, Wiley,2019</li> </ol>  |  |
| <b>e-Books:</b>  |  |
| <ol style="list-style-type: none"> <li>1. <a href="https://www.knime.com/sites/default/files/inline-images/KNIME_quickstart.pdf">https://www.knime.com/sites/default/files/inline-images/KNIME_quickstart.pdf</a></li> <li>2. <a href="http://www.cs.ccsu.edu/~markov/weka-tutorial.pdf">http://www.cs.ccsu.edu/~markov/weka-tutorial.pdf</a></li> <li>3. <a href="https://download.e-bookshelf.de/download/0000/5791/06/L-G-0000579106-0002359656.pdf">https://download.e-bookshelf.de/download/0000/5791/06/L-G-0000579106-0002359656.pdf</a></li> </ol> |  |
| <b>MOOC Courses:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Business Analytics for management decision : <a href="https://nptel.ac.in/courses/110105089">https://nptel.ac.in/courses/110105089</a></li> <li>2. Business analytics and data mining modeling using R : <a href="https://nptel.ac.in/courses/110107092">https://nptel.ac.in/courses/110107092</a></li> <li>3. Business Analysis for Engineers : <a href="https://nptel.ac.in/courses/110106050">https://nptel.ac.in/courses/110106050</a></li> </ol>  |  |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| <b>CO1</b>               | 3   | 2   | 2   | 1   | -   | -   | -   | -   | 2   | 1    | -    | -    | 3    | 2    | 3    |
| <b>CO2</b>               | 3   | 3   | 2   | 2   | -   | 2   | -   | -   | 2   | 2    | -    | 1    | 3    | 2    | 3    |
| <b>CO3</b>               | 3   | 3   | 3   | 2   | 3   | 2   | -   | -   | 3   | 2    | 1    | 2    | 3    | 3    | 3    |
| <b>CO4</b>               | 3   | 3   | 3   | 3   | 3   | 2   | -   | -   | 3   | 2    | 2    | 1    | 3    | 3    | 2    |
| <b>CO5</b>               | 3   | 3   | 3   | 2   | 3   | 3   | -   | -   | 3   | 3    | 2    | 2    | 3    | 3    | 3    |
| <b>CO6</b>               | 3   | 2   | 2   | 2   | 2   | 3   | -   | -   | 3   | 2    | 1    | 1    | 3    | 3    | 2    |



| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>First Year MCA</b><br><b>Program Elective Course-2</b><br><b>24P1512-D : UI/UX Design</b>   |  |   |
|---|--|---|
| Teaching Scheme   | Credit   | Examination Head: TH<br>Examination Scheme & Marks                                  |
| TH: 04 Hours/Week   | 04   | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |
| <b>Prerequisite:</b> Software Engineering   |  |   |
| <b>Companion Course, if any:</b> Program Elective Course 2 Lab (24P1514)  |  |   |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To learn the factors that determine how people use technology</li> <li>To study the usable software-enabled user-interfaces</li> <li>To achieve efficient, effective, and safe interaction</li> <li>To Explore various models and factors that affect response time</li> <li>To explore the challenges associated with information visualization and its societal and individual impacts.</li> </ul>   |  |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–   |  | <b>BL</b>   |
| <b>CO1: Understand</b> the principles of User Interface   |  | <b>2</b>  |
| <b>CO2:Plan</b> strategies for managing design projects   |  | <b>5</b>  |
| <b>CO3:Examine</b> the data-driven UI designs and user experiences  |  | <b>4</b>  |
| <b>CO4:Test</b> the usability of a design through usability evaluations   |  | <b>4</b>  |
| <b>CO5:Recognize</b> the quality of service and data visualization  |  | <b>2</b>  |
| <b>CO6:Describe</b> user experience fundamentals  |  | <b>2</b>  |
| Course Contents   |  |   |
| Unit I  | Introduction and Overview                                      | (08 Hrs.)   |
| Introduction to User experience and user Interaction-Usability of interactive systems, goals and measures, Universal Usability, Characteristics of graphical and web user interfaces, guidelines, principles and theories of good design, User Experience- Concept of UX, Trends in UX, 6 Stages used to UX design , Applications of UX design, The Relationship Between UI and UX , Roles in UI/UX   |  |   |
| <b>Case Studies</b>   | Redesigning an E-Commerce Website for Improved User Experience |   |
| Unit II   | Design Process   | (08 Hrs.)   |
| Managing design processes, organizational design to support usability, pillars of design, development methodologies, Human considerations in Design, Usability- principles to support usability, assessment in the design process, Usability problems, practical measures of usability, objective measures of usability, golden rules of interface design, Evaluating Interface Design –Introduction, Expert reviews, Usability testing, Acceptance tests, Legal issues |  |   |
| <b>Case Studies</b>   | Enhance an Online Learning Platform's User Interface           |   |
| Unit III  | Interaction Styles   | (08 Hrs.)   |
| Direct manipulation and virtual environment, Develop system menus and navigation schemes-Structure of menus, Function of menus, content of menus, phrasing the menu, navigating menus, kinds of graphical menus, form fill-in and dialog boxes, command-organization , functionality, strategies and structure, naming and abbreviations, interaction devices, collaboration and social media participation   |  |   |

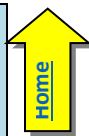


|   |   |                  |
|---|---|------------------|
| <b>Case Studies</b>   | Redesign_Music Streaming App with Command-Based Interaction |                  |
| <b>Unit IV</b>  | <b>Implementation support and Screen Based Control</b>      | <b>(08 Hrs.)</b> |
| Implementation support: Support, training and learning, requirement of user support, element of windowing systems, Individual window design, multiple window design, command organization strategies command menus, natural languages in computer, Screen Based Controls: Selection control-Radio buttons, check boxes, list boxes, Read-only controls- text boxes, Operable controls - buttons, slider, tab, scroll bar, clear text and messages, text for web pages, Graphics, icons and images, Presentation controls-Static text fields, Group boxes, column headings, tool tips, progress indicators |   |                  |
| <b>Case Studies</b>   | Discuss Screen-Based Control for a Smart Home Control App   |                  |
| <b>Unit V</b>   | <b>Design Issues</b>  | <b>(08 Hrs)</b>  |
| Quality of service- Models of response time impacts, user productivity, variability in response time, Balancing function and fashion- Error messages, display design, web page design, window design, color, Information visualization – data type by task taxonomy, challenges for information visualization, societal and individual impact of user interface   |   |                  |
| <b>Case Studies</b>   | Discuss issues in Accessibility in an Education Portal      |                  |

| Learning Resources   |  |
|--|--|
| <b>Text Books:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Creative Tim ,“Fundamentals of Creating a Great UI/UX”, 1st Edition</li> <li>2. Jon Yablonski, “Laws of UX: Using Psychology to Design Better Products &amp; Services” , O'REILLY Publication</li> <li>3. Jenifer Tidwell, Charles Brewer, Aynne Valencia “Designing Interfaces: Patterns for Effective Interaction Design”, O'REILLY Publication</li> </ol> |  |
| <b>Reference Books:</b>  |  |
| <ol style="list-style-type: none"> <li>1. Shneiderman, Plaisant,Cohen, Jacobs, “Designing the User Interface-Strategies for Effective Human Computer Interaction”, 5th Edition PEARSON Publication</li> <li>2. Wilbert O. Galitz “The Essential Guide to User Interface Design”, 2nd Edition, WILEY Publication</li> </ol>   |  |
| <b>e-Books:</b>  |  |
| <ul style="list-style-type: none"> <li>• <a href="https://www.uxpin.com/studio/ebooks/designops-design-system-report/">https://www.uxpin.com/studio/ebooks/designops-design-system-report/</a></li> <li>• <a href="http://theuxreader.com/products/the-ux-reader-ebook">http://theuxreader.com/products/the-ux-reader-ebook</a></li> </ul>   |  |
| <b>MOOC Courses:</b>   |  |
| <ul style="list-style-type: none"> <li>• <a href="https://archive.nptel.ac.in/courses/124/107/124107008/#">https://archive.nptel.ac.in/courses/124/107/124107008/#</a></li> </ul>  |  |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1                      | 3   | 2   | 2   | -   | 1   | -   | -   | -   | 2   | 1    | -    | -    | 2    | 3    | 3    |
| CO2                      | 3   | 3   | 3   | 2   | 2   | 2   | -   | 1   | 3   | 2    | 1    | 2    | 3    | 2    | 3    |
| CO3                      | 3   | 3   | 3   | -   | 2   | 3   | -   | 1   | 3   | 2    | -    | -    | 3    | 3    | 2    |
| CO4                      | 2   | 3   | 2   | 3   | 3   | 2   | -   | 2   | 3   | 3    | 2    | 1    | 3    | 2    | 2    |
| CO5                      | 3   | 2   | 2   | 2   | 3   | 3   | -   | -   | 2   | 2    | 1    | -    | 3    | 2    | 3    |
| CO6                      | 3   | 2   | 2   | -   | 2   | 3   | -   | -   | 3   | 2    | 1    | -    | 2    | 3    | 3    |





| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>First Year MCA</b><br><b>24P1513: Software Lab II</b>   |        |                                |
|---|--------|--------------------------------|
| Teaching Scheme:  | Credit | Examination Head: PR           |
|   |        | Examination Scheme & Marks     |
| PR: 04 Hours/Week   | 02     | ISE: 40 Marks<br>ESE: 60 Marks |
| <b>Companion Course: Java Programming(24P1510) &amp; Web Technology(24P1511)</b>  |        |                                |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To learn the core concept of Java programming</li> <li>To introduce the working environment of Java Program using the multithreading and file handling</li> <li>To learn the web based development environment</li> <li>To use client side and server side web technologies</li> <li>To design and develop web applications using front end technologies and backend databases</li> </ul>  |        |                                |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–   |        | <b>BL</b>                      |
| <b>CO1: Design</b> and implement Java classes and objects effectively to solve real-world problems  |        | <b>5</b>                       |
| <b>CO2: Understand</b> the basics of using Java in web service creation and integration   |        | <b>2</b>                       |
| <b>CO3: Comprehend</b> the core concepts of web development   |        | <b>2</b>                       |
| <b>CO4: Develop</b> dynamic and interactive web pages using JavaScript  |        | <b>3</b>                       |
| <b>CO5: Implement</b> server-side programming using technologies such as PHP  |        | <b>3</b>                       |
| <b>CO6: Apply</b> theoretical knowledge to real-world scenarios by engaging in experiential learning activities such as high-end equipment demonstrations, participating in industry visits, and organizing or participating in technical events so as to imbibe problem-solving skills, foster innovation, and build professional competencies necessary for successful careers in engineering.  |        | <b>3</b>                       |
| <b>Guidelines for Instructor's Manual</b>   |        |                                |
| The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual needs to include prologue (about University/program/ institute/ department/foreword/ preface etc), copy of curriculum, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.  |        |                                |
| <b>Guidelines for Student's Lab Journal</b>   |        |                                |
| The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory-Concept in brief, features of tool/framework/language used, Design, test cases, conclusion. Program codes with sample output of all performed assignments are to be submitted as softcopy. |        |                                |
| As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journals may be avoided. Use of DVD containing student programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.   |        |                                |
| <b>Guidelines for Lab /TW Assessment</b>  |        |                                |
| Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of students. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.   |        |                                |
| <b>Guidelines for Laboratory Conduction</b>   |        |                                |

List of laboratory assignments is provided below for reference. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy needs to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute them among batches of students. It is appreciated if the assignments are based on real world problems/applications. Encourage students for appropriate use of coding style, proper indentation and comments. **Use of open source software and recent versions is to be encouraged.** In addition to these, instructors may assign one real life application in the form of a mini-project based on the concepts learned. Instructors may also set one assignment or mini-project that is suitable to each branch beyond the scope of the syllabus.

**Suggested List of Laboratory Experiments/Assignments**  
(Instructor may design a newer one)

**Group A-Java Programming(24P1510)**

| Sr. No. | Experiments/Assignments  | CO            |
|---------|--|---------------|
| 1       | Write a program in Java to input marks of five subjects and find their sum and average.  | CO1, CO6      |
| 2       | Write a program in Java using parameterized constructor with two parameters id and name. While creating the objects obj1 and obj2 passed two arguments so that this constructor gets invoked after creation of obj1 and obj2.  | CO1, CO2, CO6 |
| 3       | Write a Java program to create a class called Vehicle with a method called drive (). Create a subclass called Car that overrides the drive () method to print "Repairing a car".   | CO1, CO2, CO6 |
| 4       | Write a Java program to create an interface Shape with the getArea() method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the getArea() method for each of the three classes.  | CO1, CO2, CO6 |
| 5       | Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number. | CO1, CO2, CO6 |
| 6       | Write a Java program to create a class called Bank Account with private instance variables account Number and balance. Provide public getter and setter methods to access and modify these variables.  | CO1, CO2, CO6 |
| 7       | Write a Java program to create a method that takes an integer as a parameter and throws an exception if the number is odd.   | CO1, CO6      |
| 8       | Write a Java program to insert the specified element at the specified position in the linked list.   | CO1, CO2, CO6 |

**Suggested List of Laboratory Experiments/Assignments**

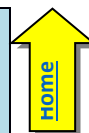
**Group B-Web Technology(24P1511)**

| Sr. No. | Experiments/Assignments  | CO                 |
|---------|--|--------------------|
| 1       | Design and develop a suitable static website which shows the ecommerce/college/exam admin dashboard using HTML, CSS  | CO3, CO4, CO5, CO6 |
| 2       | Write a JavaScript Program to get the user registration data and push to array/local storage with AJAX POST method and data list in the new page   | CO3, CO4, CO5, CO6 |
| 3       | Create Student data in XML and extract data using queries.   | CO3, CO4, CO5, CO6 |
| 4       | Build a dynamic web application using PHP and MySQL. a. Create database tables in MySQL and create connections with PHP. b. Create the add, update, delete and retrieve functions in the PHP web app interacting with MySQL database | CO3, CO4, CO5, CO6 |

|                     |   |                    |
|---------------------|---|--------------------|
| 5                   | Design a login page with entries for name, mobile number, email id and login button. Use struts and perform following validations a. Validation for correct names b. Validation for mobile numbers c. Validation for email id d. Validation if no entered any value e. Re-display for wrongly entered values with message. Congratulations and welcome page upon successful entries | CO3, CO4, CO5, CO6 |
| <b>Mini-Project</b> |   |                    |
| 1                   | Design any Game applications using Java.  | CO1, CO2           |
| 2                   | Design and implement a dynamic web application for any business functionality by using web development technologies that you have learnt in the above given assignments.  | CO3, CO4, CO5, CO6 |

| Learning Resources   |  |
|--|--|
| <b>Text Books:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Programming with Java , A primer ,Fourth edition , By E. Balagurusamy</li> <li>2. Herbert Schilt, "JAVA Complete Reference", 7th Edition, Tata McGraw Hill, ISBN: 9780070636774</li> <li>3. Java 2 programming black books, Steven Horlizer</li> <li>4. Complete reference HTML, TMH, 4th Ed.</li> <li>5. Web Technologies - 2nd Edition, Tata McHill by Achut Godbole</li> <li>6. HTML, DHTML, JavaScript, Perl &amp; CGI Ivan Bayross, BPB Pub, 3rd Ed</li> <li>7. Ralph Moseley &amp; M. T. Savaliya, "Developing Web Applications", Wiley publications, ISBN 13 : 9788126538676</li> </ol> |  |
| <b>Reference Books:</b>  |  |
| <ol style="list-style-type: none"> <li>1. Eckel B., "Thinking in Java", 3rd Edition, Pearson Education</li> <li>2. Complete Reference Java" by Herbert Schildt(5th edition)</li> </ol>   |  |
| <b>MOOC Courses:</b>   |  |
| <ol style="list-style-type: none"> <li>1. <a href="http://tutorialpoint.com/">http://tutorialpoint.com/</a></li> <li>2. <a href="http://www.w3schools.in/java-tutorial">http://www.w3schools.in/java-tutorial</a></li> </ol>   |  |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1                      | 3   | 3   | 2   | 1   | 3   | 1   | 1   | 1   | 2   | 1    | 2    | 2    | 3    | 3    | 3    |
| CO2                      | 3   | 3   | 3   | 3   | 3   | 1   | 1   | 1   | 2   | 1    | 3    | 3    | 2    | 3    | 3    |
| CO3                      | 3   | 3   | 3   | 1   | 3   | 1   | 1   | 1   | 3   | 1    | 3    | 3    | 3    | 3    | 3    |
| CO4                      | 3   | 3   | 3   | 1   | 3   | 1   | 1   | 1   | 3   | 1    | 3    | 3    | 3    | 3    | 3    |
| CO5                      | 3   | 3   | 3   | 1   | 3   | 1   | 1   | 1   | 3   | 1    | 3    | 3    | 3    | 3    | 3    |
| CO6                      | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3    | 3    | 3    | 3    | 3    | 3    |



| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>First Year MCA</b><br><b>24P1514: Program Elective Course 2 Lab</b>  |               |                                       |
|--|---------------|---------------------------------------|
| <b>Teaching Scheme:</b>  | <b>Credit</b> | <b>Examination Head: PR</b>           |
|  |               | <b>Examination Scheme &amp; Marks</b> |
| <b>PR: 04 Hours/Week</b>   | <b>02</b>     | ISE: 40 Marks<br>ESE: 60 Marks        |
| <b>Companion Course: Program Elective Course -2(24P1512)</b>   |               |                                       |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To Develop Quantum Programming Skills</li> <li>To Solve Real-World Problems Using Cloud Technologies</li> <li>To Implement BI Applications</li> <li>To Develop Interactive and Responsive UI Designs</li> </ul>   |               |                                       |
| <b>Course Outcomes: On completion of the course, learner will be able to–</b>  |               | <b>BL</b>                             |
| <b>CO1: Apply</b> Quantum Programming to Emerging Fields   |               | <b>3</b>                              |
| <b>CO2: Apply</b> cloud storage solutions for data management and retrieval.   |               | <b>3</b>                              |
| <b>CO3: Gain</b> hands-on experience with BI tools for developing end-to-end BI solutions.   |               | <b>3</b>                              |
| <b>CO4: Analyze</b> and Visualize Data   |               | <b>4</b>                              |
| <b>CO5: Design</b> Interactive User Interfaces   |               | <b>5</b>                              |
| <b>CO6: Apply</b> theoretical knowledge to real-world scenarios by engaging in experiential learning activities such as high-end equipment demonstrations, participating in industry visits, and organizing or participating in technical events so as to imbibe problem-solving skills, foster innovation, and build professional competencies necessary for successful careers in engineering.   |               | <b>3</b>                              |
| <b>Guidelines for Instructor's Manual</b>  |               |                                       |
| The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual needs to include prologue (about University/program/ institute/ department/foreword/ preface etc), copy of curriculum, conduction & Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.   |               |                                       |
| <b>Guidelines for Student's Lab Journal</b>  |               |                                       |
| The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory-Concept in brief, features of tool/framework/language used, Design, test cases, conclusion. Program codes with sample output of all performed assignments are to be submitted as softcopy.<br>As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journals may be avoided. Use of DVD containing student programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory. |               |                                       |
| <b>Guidelines for Lab /TW Assessment</b>   |               |                                       |

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of students. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

### Guidelines for Laboratory Conduction

List of laboratory assignments is provided below for reference. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy needs to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute them among batches of students. It is appreciated if the assignments are based on real world problems/applications. Encourage students for appropriate use of coding style, proper indentation and comments. **Use of open source software and recent versions is to be encouraged.** In addition to these, instructors may assign one real life application in the form of a mini-project based on the concepts learned. Instructors may also set one assignment or mini-project that is suitable to each branch beyond the scope of the syllabus.

### Suggested List of Laboratory Experiments/Assignments (Instructor may design a newer one)

#### 24P1512 – A : Quantum Computing

**Any 4 assignment and 1 Mini Project is mandatory.**

| Sr. No. | Experiments/Assignments  | CO       |
|---------|--|----------|
| 1       | Implement Quantum Search Algorithm using Quantum Dice.   | CO1, CO6 |
| 2       | Implement and analyze quantum algorithms using simulated quantum hardware, focusing on qubit operations, quantum gates, and algorithmic performance. | CO1, CO6 |
| 3       | Analyze simple states of superposition and the effect of doing the measurement in different basis states.  | CO1, CO6 |
| 4       | Build simple quantum circuits with single and two-qubit gates.   | CO1, CO6 |
| 5       | Implement quantum programs in NISQ model of computing.   | CO1, CO6 |
| 6       | Analyze the effectiveness of simple error correction scheme.   | CO1, CO6 |
| 7       | Make a script for visualizing the energy levels of Hamiltonians.   | CO1, CO6 |
| 8       | <b>Mini Project:</b> 1. Build a Quantum Random Number Generator.<br>2. Implement Grover's Search Algorithm.<br>3. Use of Shor's Algorithm.           | CO1, CO6 |

#### 24P1512-B: Cloud Computing

**Any 4 assignment and 1 Mini Project are mandatory.**

| Sr. No. | Experiments/Assignments   | CO       |
|---------|---|----------|
| 1       | Case study on Microsoft azure to learn about Microsoft Azure is a cloud computing platform and infrastructure, created by Microsoft, for building, deploying and managing applications and services through a global network of Microsoft-managed data centers. | CO2, CO6 |

| 2   | Case study on Amazon EC2 and learn about Amazon EC2 web services.  | CO2,<br>CO6         |
|---|--|---------------------|
| 3   | Creating an Application in Salesforce.com using Apex programming Language.   | CO2,<br>CO6         |
| 4   | Design and develop custom Application (Mini Project) using Sales force Cloud.  | CO2,<br>CO6         |
| 5   | Setup your own cloud for Software as a Service (SaaS) over the existing LAN in your laboratory. In this assignment student should write their own code for cloud controller using open-source technologies to implement with HDFS.   | CO2,<br>CO6         |
| 6   | Implement the basic operations may be like to divide the file in segments/blocks and upload/ download file on/from cloud in encrypted form.  | CO2,<br>CO6         |
| <b>24P1512-C Business Intelligence and Analytics</b>      |  |                     |
| <b>Any 4 assignment and 1 Mini Project are mandatory.</b> |  |                     |
| Sr. No.   | Experiments/Assignments  | CO                  |
| 1   | Import the legacy data from different sources such as (Excel , Sql Server, Oracle etc.) and load in the target system. (Student can download sample database such as Adventure works, Northwind, foodmart etc.)  | CO3,<br>CO4,<br>CO6 |
| 2   | Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sql server.   | CO3,<br>CO4,<br>CO6 |
| 3   | Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.   | CO3,<br>CO4,<br>CO6 |
| 4   | Import the data warehouse data in Microsoft Excel and create the Pivot table and Pivot Chart.  | CO3,<br>CO4,<br>CO6 |
| 5   | Perform the data classification using classification algorithm. Or Perform the data clustering using clustering algorithm.   | CO3,<br>CO4,<br>CO6 |
| 6   | <b>Mini Project:</b> Each group of 4 Students (max) assigned one case study for this; A BI report must be prepared outlining the following steps:<br>a) Problem definition, identifying which data mining task is needed.<br>b) Identify and use a standard data mining dataset available for the problem. | CO3,<br>CO4,<br>CO6 |
| <b>24P1512-D : UI/UX Design</b>                           |  |                     |
| <b>Any 4 assignment and 1 Mini Project are mandatory.</b> |  |                     |
| Sr. No  | Experiments/Assignments  | CO                  |
| 1   | Analyze an existing app and defining your app's functions step-by-step   | CO5,<br>CO6         |
| 2   | Experiments with Non-Visual Prototyping & User Testing   | CO5,<br>CO6         |
| 3   | Create a generic prototype of any application both in Web vs. App  | CO5,<br>CO6         |
| 4   | Test your sitemap using Treejac  | CO5,<br>CO6         |
| 5   | Mini Project based on stages of the UI/UX development process  | CO5,<br>CO6         |



### Learning Resources

**Text Books:**

1. Programming with Java, A primer, Fourth edition, By E. Balagurusamy
2. Herbert Schilt, "JAVA Complete Reference", 7th Edition, Tata McGraw Hill, ISBN: 9780070636774
3. Java 2 programming black books, Steven Horlizer
4. Complete reference HTML, TMH, 4th Ed.
5. Web Technologies - 2nd Edition, Tata McHill by Achut Godbole

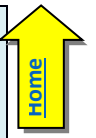
**Reference Books:**

1. Eckel B., "Thinking in Java", 3rd Edition, Pearson Education
2. Complete Reference Java" by Herbert Schildt(5th edition)
3. Core Java 2 Volume - I Cay S Horstmann, Fary Cornell
4. CSS - Definitive Guide. By Eric Meyer, O'reilly Publication
5. Robin Nixon, "Learning PHP, Mysql and Javascript with JQuery, CSS & HTML5", O'REILLY, ISBN: 13:978-93-5213-015-3

### The CO-PO Mapping Matrix

| CO\PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO1</b> | 3   | 3   | 3   | 2   | 2   | 1   | 2   | 1   | 1   | 1    | 2    | 3    | 3    | 2    | 3    |
| <b>CO2</b> | 3   | 3   | 3   | 2   | 3   | 1   | 2   | 2   | 2   | 2    | 2    | 3    | 3    | 3    | 3    |
| <b>CO3</b> | 3   | 3   | 3   | 3   | 3   | 1   | 2   | 2   | 3   | 2    | 3    | 3    | 3    | 3    | 3    |
| <b>CO4</b> | 3   | 3   | 3   | 3   | 3   | 1   | 2   | 1   | 2   | 3    | 2    | 2    | 3    | 3    | 3    |
| <b>CO5</b> | 3   | 2   | 3   | 2   | 3   | 1   | 1   | 1   | 3   | 1    | 2    | 3    | 2    | 3    | 3    |
| <b>CO6</b> | 3   | 3   | 3   | 3   | 3   | 2   | -   | -   | 3   | 3    | 3    | 2    | 3    | 3    | 3    |

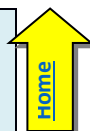




| Matoshri College of Engineering & Research Centre, Nashik<br>Master of Computer Application (2024-25)<br>First Year MCA<br>24P1515 : Mobile Application Development   |  |                                |
|---|--|--------------------------------|
| Teaching Scheme   | Credit   | Examination Scheme             |
|   |  | Examination Scheme & Marks     |
| PR: 02 Hours/Week   | 01   | ISE: 20 Marks<br>ESE: 30 Marks |
| Prerequisite: Fundamental Programming Concepts, Java Programming  |  |                                |
| Companion Course, if any: Java Programming(24P1510)   |  |                                |
| Course Objectives: <ul style="list-style-type: none"><li>To understands Mobile Development Fundamentals</li><li>To learn Mobile Programming Languages and Frameworks</li><li>To understand Mobile App Architecture and Design Patterns</li></ul>  |  |                                |
| Course Outcomes: On completion of the course, learner will be able to–  |  | BL                             |
| CO1: Demonstrate Mobile Development Concepts  |  | 3                              |
| CO2:Design and develop User Interfaces for the Android platform   |  | 5                              |
| CO3:Understand enterprise scale requirements of mobile applications   |  | 2                              |
| CO4:Demonstrate their ability to deploy software to mobile devices  |  | 3                              |
| CO5:Apply development tools, techniques, programming languages and libraries required for Mobile app development  |  | 3                              |
| CO6: Apply Mobile Architecture and Design Patterns  |  | 3                              |
| Course Contents   |  |                                |
| Unit I  | Basics of Android Application                            |                                |
| Introduction to mobile technologies, mobile operating systems, Mobile devices –pros and cons, Introduction to Android, Installing Android Studio, Java for Android Versions, Features, Architecture, Building a sample Android application, A Framework for a Well-Behaved Application, Application Context, Activities, Services, Intents, Intent Filter, Permissions, Receiving and Broadcasting Intents, |  |                                |
| Case Studies  | Discuss Basic Android Button Click Application           |                                |
| Unit II   | Android Application and User Interface Design            |                                |
| Using Intent Filter, Permissions, Android Manifest File and its common settings, managing different types application resources in a hierarchy, User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation ,Drawing 2D and 3D Graphics and Multimedia   |  |                                |
| Case Studies  | Designing a Simple Android Login Screen                  |                                |
| Unit III  | Android Networking and Development                       |                                |
| Android Networking, Web and Telephony API, Search, Location and Mapping, Sensors, NFC, Speech, Gestures, and Accessibility, Communication, Identity, Sync, and Social Media, The Android Native Development Kit (NDK)   |  |                                |
| Case Studies  | Discuss Uploading Data to Server with Android Networking |                                |
| Unit IV   | Android Application Publishing and Content Providers     |                                |

|   |  |
|---|--|
| Handling and Persisting Data, A Content Provider as a Facade for a RESTful Web Service, Using Content Providers, Deploying Android Application to the World, Selling your Android application   |  |
| <b>Case Studies</b>   | Discuss Publishing an Android Application to Google Play Store |
| <b>Unit V</b>   | <b>Mini Project</b>  |
| Design any Mobile Application using Android.  |  |
| <b>Learning Resources</b>   |  |
| <b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Wei-Meng Lee,” Beginning Android Application Development”, 1st Ed, Wiley Publishing.</li> <li>2. J. F. DiMarzio, “Android: A Programmer's Guide”, McGraw Hill Education (India) Private Limited.1st Edition</li> </ol>   |  |
| <b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Responsive Web Design with Html5 and Css3 by Ben Frain, second Edition</li> <li>2. Lean Mobile App Development by Mike van Drongelen, Adam Dennis Richard Garabedian Alberto Gonzalez Aravind Krishnaswamy</li> <li>3. Practical Android: 14 Complete Projects on Advanced Techniques and Approaches by by Mark Wickham</li> <li>4. Head First Android Development: A Brain-Friendly Guide 2nd Edition</li> </ol> |  |
| <b>e-Books:</b> <ol style="list-style-type: none"> <li>1. <a href="https://freecomputerbooks.com/mobileAndroidProgrammingBooks.html">https://freecomputerbooks.com/mobileAndroidProgrammingBooks.html</a></li> </ol>  |  |
| <b>MOOC Courses:</b> <ol style="list-style-type: none"> <li>1. <a href="https://onlinecourses.nptel.ac.in/noc20_cs52/preview">https://onlinecourses.nptel.ac.in/noc20_cs52/preview</a></li> </ol>   |  |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| <b>CO1</b>               | 3   | 3   | 2   | 1   | 3   | -   | -   | 1   | 2   | 2    | -    | -    | 3    | 3    | 3    |
| <b>CO2</b>               | 3   | 3   | 3   | 2   | 3   | 2   | -   | 2   | 3   | 2    | 1    | -    | 3    | 2    | 2    |
| <b>CO3</b>               | 2   | 3   | 3   | 2   | 2   | 2   | -   | 1   | 2   | 3    | -    | -    | 3    | 3    | 3    |
| <b>CO4</b>               | 3   | 3   | 2   | 3   | 3   | 2   | -   | 1   | 3   | 3    | 1    | 2    | 3    | 3    | 2    |
| <b>CO5</b>               | 3   | 2   | 3   | 3   | 3   | 3   | -   | 2   | 3   | 2    | 2    | 1    | 3    | 3    | 3    |
| <b>CO6</b>               | 3   | 3   | 2   | 3   | 3   | 3   | -   | 2   | 3   | 3    | 1    | 2    | 3    | 2    | 3    |



| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>First Year MCA</b><br><b>24P1516 : Human Rights</b>  |        |                                |
|--|--------|--------------------------------|
| Teaching Scheme  | Credit | Examination Scheme             |
|  |        | Examination Scheme & Marks     |
| TUT: 02 Hours/Week   | 02     | ISE: 20 Marks<br>ESE: 30 Marks |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To help students understand how human rights are protected under Indian criminal laws and the Constitution.</li> <li>To teach the role of police, courts, jails, and legal aid in protecting human rights.</li> <li>To discuss problems like custodial violence and suggest ways to improve justice and protect vulnerable groups.</li> </ul> |        |                                |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–  |        | <b>BL</b>                      |
| <b>CO1:</b> Understand the Constitutional Framework for Human Rights   |        | <b>2</b>                       |
| <b>CO2:</b> Evaluate legal and constitutional protections against torture and inhumane treatment   |        | <b>4</b>                       |
| <b>CO3:</b> Apply Human Rights Norms to Criminal Justice Practices   |        | <b>3</b>                       |
| <b>CO4:</b> Analyze the Need for Reformation of Jail Manuals and Prison Rules  |        | <b>3</b>                       |
| <b>CO5:</b> Understand the Right to Free Legal Aid for Disabled Persons and Judicial Responses   |        | <b>2</b>                       |
| <b>CO6:</b> Understand Theories of Punishment  |        | <b>2</b>                       |
| Course Contents  |        |                                |
| Module #1  |        |                                |
| Constitutional mechanism for enforcement of Human Rights, Role of Supreme Court under the constitution of India, Role of High Court, Role of Subordinate judiciary, Public Interest Litigation, Origin and development of Legal Aid, Related provision of Legal Aid under the Indian Laws, Human Rights under the Preventive Detention Laws  |        |                                |
| Module #2  |        |                                |
| Safeguard against other General and Special Criminal Laws, Right against Arbitrary Arrest, Right against Torture, , Right of Accused Person , Right to Legal Aid and assistant for the accused person, Emergency provision under the constitution, International standard norms of Human Rights during Emergency, Judicial responses to the protection of Human Rights during the Emergency                    |        |                                |
| Module #3  |        |                                |
| Rights of detainees under the Indian Laws, Protection of Human Rights for Male prisoners, Protection of Human rights for Women Prisoners, Judicial approach to protection of prisoner's rights, Nature and scope of criminal justice system in India, Administration of justice and the role of the court, Justice delivery system under the criminal laws, Protection of accused person under the Indian Laws |        |                                |
| Module #4  |        |                                |

Role of police under the criminal Laws, Importance of investigation in criminal justicing system, law enforcement agencies and custodial crimes against men, Law enforcement agencies and custodial crime against women and children, Theories of Punishments, Importance of Jail, Reformation of Jail manuals and rules, Importance of Juvenile homes in India.

### Module #5

Reformation of Juvenile Homes, Protection of Women Rights under the criminal Laws of India, Protection of Women Rights under the International Law, , Protection of Child Rights under the criminal Laws of India, Protection of child rights under the International law, Meaning and definition of disabled person and their legal status, Disability and Human Rights: National and International Perspectives, Right to free Legal Aid of the disable people and judicial response to their problem

### Learning Resources

#### Text Books:

1. HANDBOOK OF HUMAN RIGHTS AND CRIMINAL JUSTICE IN INDIA P: Third Edition
2. "Human Rights And Criminal Justice" by Pandit Kamalakar

#### Reference Books:

1. Criminal Justice: A Human Rights Perspective of the Criminal Justice Process in India by Dr. K.I. Vibhute

#### e-Books:

1. <https://nhrc.nic.in/sites/default/files/I-%20BOOK.pdf>
2. <https://nhrc.nic.in/sites/default/files/HREdu.pdf>

#### MOOC Courses:

[https://onlinecourses.swayam2.ac.in/cec20\\_hs24/preview](https://onlinecourses.swayam2.ac.in/cec20_hs24/preview)

### The CO-PO Mapping Matrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1   | 1   | -   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO2   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO3   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | -    |
| CO4   | -   | 3   | -   | -   | 3   | 3   | -   | -   | 3   | -    | 3    | -    | -    | 3    | -    |
| CO5   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | 3    |
| CO6   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3    | 3    | 3    | 3    | 3    | 3    |

# Semester III

| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>Second Year MCA</b><br><b>24P1517: Machine Learning</b>   |   |   |
|---|---|---|
| Teaching Scheme   | Credit  | Examination Scheme  |
|   |   | Examination Scheme & Marks  |
| TH: 04 Hours/Week   | 04  | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |
| <b>Prerequisite:</b> Fundamentals of Data Science   |   |   |
| <b>Companion Course, if any: Programming Lab 3</b>  |   |   |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To understand the basic concepts of machine learning and apply them for the various problems.</li> <li>To optimize the machine learning model and generalize it.</li> <li>To study and understand classification methods.</li> <li>To understand the need for multi-class classifiers.</li> <li>To learn the working of clustering algorithms.</li> <li>To study fundamental concepts of ANN.</li> </ul> |   |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to—   |   | <b>BL</b>   |
| <b>CO1:</b> Identify the needs and challenges of machine learning for real time applications.   |   | <b>2</b>  |
| <b>CO2:</b> Apply data pre-processing techniques to simplify and speed up machine learning algorithms.  |   | <b>3</b>  |
| <b>CO3:</b> Select and apply supervised machine learning algorithms for real time applications.   |   | <b>6</b>  |
| <b>CO4:</b> Compare and contrast different clustering algorithms.   |   | <b>6</b>  |
| <b>CO5:</b> Design a neural network for solving engineering problems.   |   | <b>5</b>  |
| <b>CO6:</b> Design a neural network for solving engineering problems.   |   | <b>5</b>  |
| Course Contents   |   |   |
| Unit I  | Introduction To Machine Learning  | (08 Hrs.)   |
| Introduction to Machine Learning, Comparison of Machine learning with traditional programming, ML vs AI vs Data Science. Types of learning: Supervised, Unsupervised, and semi-supervised, reinforcement learning techniques, Models of Machine learning: Geometric model, Probabilistic Models, Logical Models, Grouping and grading models, Parametric and non-parametric models.   |   |   |
| <b>Case Studies</b>   | <ul style="list-style-type: none"> <li>Explore the application of <b>Logical Models</b> in the domain of <b>credit scoring</b>.</li> </ul>  |   |
| Unit II   | Feature Engineering   | (08 Hrs.)   |
| Concept of Feature, Preprocessing of data: Normalization and Scaling, Standardization, Managing missing values, Introduction to Dimensionality Reduction, Principal Component Analysis (PCA), Feature Extraction: Kernel PCA, Local Binary Pattern. Introduction to various Feature Selection Techniques, Sequential Forward Selection, Sequential Backward Selection   |   |   |
| <b>Case Studies</b>   | <ul style="list-style-type: none"> <li>Analyze customer reviews to classify sentiment as positive, neutral, or negative.</li> <li>Predict the prices of houses based on various features such as location, number of rooms, size, etc. by using <b>feature engineering</b></li> </ul> |   |
| Unit III  | Supervised Learning : Regression and Classification   | (08 Hrs.)   |

|  |  |           |
|--|--|-----------|
| Bias, Variance, Generalization, Underfitting, Overfitting, Linear regression, Regression: Lasso regression, Ridge regression, Gradient descent algorithm. Evaluation Metrics: MAE, RMSE, R2, Classification: K-nearest neighbor, Support vector machine. Ensemble Learning: Bagging, Boosting, Random Forest, Adaboost. Evaluation Metrics and Score: Accuracy, Precision, Recall, Fscore, Cross-validation.   |  |           |
| Case Studies   | <ul style="list-style-type: none"><li>Predict energy consumption based on historical usage, weather conditions, and time of year using regression.</li><li>Classify objects (e.g., pedestrians, vehicles, traffic signs) in images captured by cameras on self-driving cars.</li></ul> |           |
| Unit IV  | Unsupervised Learning  | (08 Hrs.) |
| K-Means, K-medoids, Hierarchical, and Density-based Clustering, Spectral Clustering. Outlier analysis: introduction of isolation factor, local outlier factor. Evaluation metrics and score: elbow method, extrinsic and intrinsic methods   |  |           |
| Case Studies   | <ul style="list-style-type: none"><li>Market basket analysis/ Customer Segmentation</li></ul>  |           |
| Unit V   | Introduction To Neural Networks  | (08 Hrs.) |
| Artificial Neural Networks: Single Layer Neural Network, Multilayer Perceptron, Back Propagation Learning, Functional Link Artificial Neural Network, and Radial Basis Function Network, Activation functions  |  |           |
| Case Studies   | <ul style="list-style-type: none"><li>Predict students' final grades based on their study hours, attendance, and past performance.</li></ul>   |           |
| Learning Resources   |  |           |
| Text Books: <ul style="list-style-type: none"><li>1. Bishop, Christopher M., and Nasser M. Nasrabadi, —Pattern recognition and machine learning, Vol. 4. No. 4. New York: springer, 2006.</li><li>2. Ethem Alpaydin, — Introduction to Machine Learning, PHI 2nd Edition-2013</li></ul>  |  |           |
| Reference Books: <ul style="list-style-type: none"><li>1. Tom Mitchell, —Machine learning, McGraw-Hill series in Computer Science, 1997</li><li>2. Shalev-Shwartz, Shai, and Shai Ben-David, —Understanding machine learning: From theory to algorithms, Cambridge university press, 2014.</li><li>3. Jiawei Han, Micheline Kamber, and Jian Pei, —Data Mining: Concepts and Techniques, Elsevier Publishers Third Edition, ISBN: 9780123814791, 9780123814807</li></ul> |  |           |
| e-Books: <ul style="list-style-type: none"><li>1.Foundation of Machine Learning: <a href="https://cs.nyu.edu/~mohri/mlbook">https://cs.nyu.edu/~mohri/mlbook</a></li><li>2. Dive into Deep Learning: <a href="http://d2l.ai/">http://d2l.ai/</a></li></ul>   |  |           |
| MOOC Courses:<br>Introduction to Machine Learning : <a href="https://nptel.ac.in/courses/106105152">https://nptel.ac.in/courses/106105152</a><br>Introduction to Machine Learning (IIT Madras): <a href="https://onlinecourses.nptel.ac.in/noc22_cs29/preview">https://onlinecourses.nptel.ac.in/noc22_cs29/preview</a>  |  |           |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1                      | 3   | 3   | 2   | 2   | 3   | 2   | 2   | 1   | 3   | 1    | 2    | 1    | 3    | 2    | 2    |
| CO2                      | 3   | 3   | 3   | 3   | 3   | 1   | 2   | 1   | 2   | 1    | 2    | -    | 3    | 3    | 2    |
| CO3                      | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 2   | 3   | 2    | 2    | 2    | 3    | 3    | 3    |
| CO4                      | 3   | 3   | 2   | 3   | 2   | 1   | 2   | 1   | 2   | 2    | 2    | 1    | 3    | 3    | 3    |
| CO5                      | 3   | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 3   | 2    | 3    | 2    | 3    | 2    | 3    |
| CO6                      | 3   | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 3   | 2    | 3    | 2    | 3    | 3    | 3    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application (2024-25)**  
**Second Year MCA**  
**24P1518: Blockchain Technology**

**Cyber Security## - For Syllabus refer Page No. 26**

| Teaching Scheme   | Credit | Examination Scheme                                      |
|-------------------|--------|---|
|                   |        | Examination Scheme & Marks                              |
| TH: 04 Hours/Week | 04     | ISE:<br>CAT: 20 Marks<br>CCE: 20 Marks<br>ESE: 60 Marks |

**Prerequisite:** Computer Networks and Security.

**Companion Course, if any:**

**Course Objectives:**

- To understand and explore cryptography in the Blockchain.
- To explore a Blockchain platform: Ethereum and understand the concept of Tokenization.
- To understand the working of Hyper ledger.
- To understand consensus mechanism.
- To understand the applications & risks involved in Blockchain.

|  |           |
|--|-----------|
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–  | <b>BL</b> |
| <b>CO1:</b> Interpret the fundamentals and basic concepts in Blockchain.   | <b>3</b>  |
| <b>CO2:</b> Analyze the importance of Blockchain in finding the solution to the real-world problems.   | <b>4</b>  |
| <b>CO3:</b> Use Crypto wallet for cryptocurrency based transactions.   | <b>3</b>  |
| <b>CO4:</b> Explain the various consensus algorithms such as Proof of Work (PoW), Proof of Stake (PoS), Delegated Proof of Stake (DPoS), and others. | <b>4</b>  |
| <b>CO5:</b> Illustrate the Ethereum public block chain platform.   | <b>3</b>  |
| <b>CO6:</b> Identify relative application where block chain technology can be effectively used and implemented.                                      | <b>2</b>  |

**Course Contents**

| Unit I  | Mathematical Foundation for Blockchain   | (08 Hrs.) |
|---|--|-----------|
| Cryptography: Symmetric Key Cryptography and Asymmetric Key Cryptography, Elliptic Curve Cryptography (ECC), Cryptographic Hash Functions: SHA256, Digital Signature Algorithm (DSA), Merkel Trees.   |  |           |
| Case Studies  | Verify the integrity of a file shared by another person using a hashing algorithm (e.g., SHA-256).   |           |
| Unit II   | Introduction of Blockchain Technology  | (08 Hrs.) |
| Introduction of Block chain, History, Types of Block Chain, Centralized Vs. Decentralized Systems, Layers of Blockchain: Application Layer, Execution Layer, Semantic Layer, Propagation Layer, Consensus Layer, Why is Blockchain important? Limitations of Centralized Systems, Blockchain Adoption so Far. |  |           |
| Case Studies  | Design a simple blockchain structure to store transaction data, where each block contains a list of transactions, a timestamp, and a hash of the previous block. |           |
| Unit III  | Consensus in Blockchain  | (08 Hrs.) |

Consensus in Blockchain: Consensus Approach, Consensus Elements, Consensus Algorithms, Proof of Work, Byzantine General problem, Proof of Stake, Proof of Elapsed Time, Proof of Activity, Proof of Burn.

**Case Studies** Explore how stake influences the probability of being chosen as a validator.

**Unit IV** **Cryptocurrency – Bitcoin, and Token** **(08 Hrs.)**

Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics Types of Cryptocurrency, Cryptocurrency Usage, Crypto Wallets: Metamask, Coinbase, Binance

**Case Studies**

- A real estate company wants to tokenize its properties on the blockchain for fractional ownership and easier transfer of shares. Design a token system to represent property shares.
- Explore how Bitcoin wallets generate keys and enable secure transactions.

**Unit V** **Blockchain Ethereum Platform using Solidity** **(08Hrs.)**

What is Ethereum, Types of Ethereum Networks, EVM (Ethereum Virtual Machine), Introduction to smart contracts, Purpose and types of Smart Contracts, Implementing and deploying smart contracts using Solidity

**Case Studies** A company wants to issue its own ERC-20 token on the Ethereum blockchain. Understand how tokens are created and managed using smart contracts.

### Learning Resources

#### Text Books:

1. Imran Bashir, —Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained, Second Edition, Packt Publishing, 2018
2. Alex Leverington, —Ethereum Programming, Packt Publishing, 2017

#### Reference Books:

1. Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda, "Beginning Blockchain A Beginner's Guide to Building Blockchain Solutions", 2018
2. Chris Dannen, "Introducing Ethereum and Solidity", Foundations of Crypto currency and Blockchain Programming for Beginner

#### e-Books:

1. [https://users.cs.fiu.edu/~prabakar/cen5079/Common/textbooks/Mastering\\_Blockchain\\_2nd\\_Edition.pdf](https://users.cs.fiu.edu/~prabakar/cen5079/Common/textbooks/Mastering_Blockchain_2nd_Edition.pdf)
2. [https://www.lopp.net/pdf/princeton\\_bitcoin\\_book.pdf](https://www.lopp.net/pdf/princeton_bitcoin_book.pdf)

#### MOOC Courses:

NPTEL Course on —Introduction to Blockchain Technology & Applications  
<https://nptel.ac.in/courses/106/104/106104220/>

### The CO-PO Mapping Matrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1   | 3   | 2   | -   | -   | 2   | -   | 2   | -   | 2   | -    | -    | -    | 3    | 2    | 2    |
| CO2   | 3   | 3   | 2   | 2   | 3   | -   | 2   | -   | 2   | -    | 2    | -    | 3    | 3    | 2    |
| CO3   | 3   | 2   | 2   | 2   | 3   | 2   | 2   | -   | 2   | -    | -    | 2    | 3    | 2    | 3    |
| CO4   | 3   | 3   | 2   | 3   | 3   | -   | 2   | -   | 2   | -    | -    | -    | 3    | 3    | 3    |
| CO5   | 3   | 3   | 3   | 3   | 3   | -   | 2   | 2   | 2   | -    | 2    | 2    | 3    | 3    | 3    |
| CO6   | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 2   | 2   | 2    | 2    | 3    | 3    | 3    | 3    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application (2024-25)**  
**Second Year MCA**  
**24P1519 Program Elective Course-3**  
**24P1519-A: Industry 4.0 And Industrial Internet of Things**

| Teaching Scheme          | Credit    | Examination Scheme  |
|--------------------------|-----------|---|
| <b>TH: 04 Hours/Week</b> | <b>04</b> | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |

**Prerequisite:**

1. Basics of Computer Network
2. Processor Architecture

**Companion Course, if any: Programming Lab 3 (24P1519)****Course Objectives:**

1. To know the IoT fundamentals and understand the technologies.
2. To learn the concept of M2M (machine to machine) with necessary protocols.
3. To understand the Python Scripting Language and controlling hardware for IoT.
4. To learn the IoT Platforms widely used in IoT applications.
5. To understand the implementation of web-based services on IoT devices with cloud interface.
6. To introduce the IoT applications.

| <b>Course Outcomes:</b> On completion of the course, learner will be able to–                                   | <b>BL</b> |
|---|-----------|
| <b>CO1:</b> Demonstrate an understanding of the core concepts and architecture of the Internet of Things (IoT). | <b>3</b>  |
| <b>CO2:</b> Identify suitable sensors and actuators for real time scenarios.                                    | <b>2</b>  |
| <b>CO3:</b> Analyze IoT protocols for making IoT devices communication.   | <b>4</b>  |
| <b>CO4:</b> Integrate IoT systems with cloud platforms.   | <b>5</b>  |
| <b>CO5:</b> Design and Implement real time and secured IoT applications.  | <b>3</b>  |
| <b>CO6:</b> Recognize and address security challenges in IoT devices and networks.                              | <b>2</b>  |

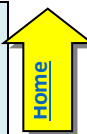
**Course Contents**

| <b>Unit I</b>  | <b>Introduction to IOT</b>  | <b>(08 hrs.)</b> |
|--|---|------------------|
| Definition and Characteristics of IoT, IoT Framework and Architecture, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT Levels and Templates, IoT Enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, Big Data Analysis, UAV, Web Services, IoT & M2M- Machine to Machine, Difference between IoT and M2M |   |                  |
| <b>Case Studies</b>  | A user wants to track their daily physical activity and health metrics, such as steps walked, heart rate, and calories burned, using a wearable IoT device. IoT in wearable devices for health and fitness. |                  |
| <b>Unit II</b>   | <b>Introduction to Sensors</b>  | <b>(08 hrs.)</b> |
| Introduction to Sensors - Light sensor, voltage sensor, Temperature and Humidity Sensor, Motion Detection Sensors, Wireless Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasonic sensor Introduction to Actuators- Connecting LED, Buzzer.  |   |                  |
| <b>Case Studies</b>  | A user wants to monitor the temperature and humidity levels in their home to ensure a comfortable living environment. Use a <b>DHT11</b> or <b>DHT22</b> sensor to measure temperature and humidity.        |                  |
| <b>Unit III</b>  | <b>Communication Protocols</b>  | <b>(08 hrs.)</b> |

|  |  |                  |
|--|--|------------------|
| Introduction to Non-IP Based Protocol (IEEE 802.11, IEEE 802.15.4), BlueTooth, ZigBee, IP Based Protocol (IPV4, IPV6, 6LoWPAN), Application Layer Protocols (MQTT, AMQP) Wireless medium access issues, MAC protocol, routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination. |  |                  |
| <b>Case Studies</b>  | Study and identify the requirements for implementing a smart campus system aimed at optimizing energy usage, enhancing security, and improving convenience.  |                  |
| <b>Unit IV</b>   | <b>IoT Security</b>  | <b>(08 hrs.)</b> |
| IoT Security: Vulnerabilities of IoT, Security Requirements, Challenges for Secure IoT, Threat Modelling, Key elements of IoT Security: Identity establishment, Access control, Data and message security, Non repudiation and availability, Security model for IoT.   |  |                  |
| <b>Case Studies</b>  | A city wants to implement a smart street lighting system that automatically adjusts based on traffic and pedestrian activity. The system should use <b>Zigbee</b> for communication between lights, sensors, and the central control system. |                  |
| <b>Unit V</b>  | <b>Introduction to IoT Programming</b>   | <b>(08 hrs.)</b> |
| Introduction to Arduino: Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.   |  |                  |
| <b>Case Studies</b>  | Design Smart Home System Using Arduino and IoT   |                  |

| Learning Resources  |  |
|---|--|
| <b>Text Books:</b>  |  |
| <ol style="list-style-type: none"> <li>1. Vijay Madiseti, ArshdeepBahga, “Internet of Things: A Hands-On Approach” , 2014, Universities Press(India) Pvt Ltd., ISBN: 9788173719547</li> <li>2. Pethuru Raj and Anupama C Raman, “The Internet of Things: Enabling Technologies, Platforms and Use Cases”, 2017, CRC Press, ISBN: 13:978-1-4987-6128-4.</li> </ol> |  |
| <b>Reference Books:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Peter Waher, “Learning Internet of Things”, 2015, Packt Publishing, ISBN: 978-1-78355-353-2</li> <li>2. Peter Friess, “Internet of Things – From Research and Innovation to Market Deployment”, 2014, River Publishers, ISBN: 978-87-93102-94-1</li> </ol>  |  |
| <b>e-Books:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Cloud for IoT– ThingSpeak: <a href="https://thingspeak.com/">https://thingspeak.com/</a></li> <li>2. Cloud for IoT - Ubidots: <a href="https://ubidots.com/stem/">https://ubidots.com/stem/</a></li> </ol>  |  |
| <b>MOOC Courses:</b>  |  |
| <a href="https://onlinecourses.nptel.ac.in/noc21_cs17/preview">https://onlinecourses.nptel.ac.in/noc21_cs17/preview</a>   |  |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| <b>CO1</b>               | 3   | 2   | 2   | 1   | 2   | 1   | 2   | 1   | 2   | 1    | 1    | 1    | 3    | 3    | 2    |
| <b>CO2</b>               | 3   | 3   | 2   | 2   | 3   | 1   | 2   | 1   | 2   | 1    | 1    | 1    | 3    | 3    | 2    |
| <b>CO3</b>               | 3   | 3   | 2   | 3   | 3   | 1   | 2   | 2   | 2   | 1    | 2    | 2    | 3    | 3    | 3    |
| <b>CO4</b>               | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 2   | 3   | 1    | 2    | 3    | 3    | 3    | 3    |
| <b>CO5</b>               | 3   | 3   | 3   | 3   | 2   | 3   | 3   | 1   | 3   | 3    | 3    | 3    | 3    | 3    | 3    |
| <b>CO6</b>               | 2   | 2   | 1   | 2   | 2   | 2   | -   | 1   | 1   | -    | 1    | 1    | 3    | 2    | 2    |



| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>Second Year MCA</b><br><b>24P1519 Program Elective Course-3</b><br><b>24P1519-B: Natural Language Processing</b>   |   |   |
|--|---|---|
| Teaching Scheme  | Credit  | Examination Scheme  |
| TH: 04 Hours/Week  | 04  | Examination Scheme & Marks  |
|  |   | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |
| <b>Prerequisite:</b>   |   |   |
| <b>Companion Course, if any: Programming Lab 3 (24P1519)</b>   |   |   |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To understand the basic concepts of Natural Language Processing (NLP)</li> <li>To acquire the knowledge of various morphological, syntactic, and semantic NLP tasks</li> <li>To use appropriate tools and techniques for processing natural languages</li> <li>To learn and implement Machine Translation techniques</li> <li>To design and develop different application using NLP</li> </ul>  |   |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–  |   | <b>BL</b>   |
| <b>CO1:</b> Describe the fundamental concepts in field of NLP  |   | <b>2</b>  |
| <b>CO2:</b> Analyze morphological, syntactic and semantic structures in natural language   |   | <b>4</b>  |
| <b>CO3:</b> Illustrate various language modelling techniques   |   | <b>3</b>  |
| <b>CO4:</b> Integrate the NLP techniques for the information retrieval task  |   | <b>5</b>  |
| <b>CO5:</b> Demonstrate the use of NLP tools and techniques for text-based processing of natural languages   |   | <b>3</b>  |
| <b>CO6:</b> Develop real world NLP applications  |   | <b>5</b>  |
| Course Contents  |   |   |
| Unit I   | Fundamentals of Natural Language Processing   | (08 Hrs.)   |
| History of NLP, Generic NLP system, levels of NLP, Knowledge in language processing, Ambiguity in Natural language, stages in NLP, challenges of NLP, Applications of NLP, Approaches of NLP: Rule based, Data Based, Knowledge Based approaches   |   |   |
| <b>Case Studies</b>  | A language learning app wants to help students understand the grammatical structure of sentences by tagging each word with its part of speech (e.g., noun, verb, adjective). Use <b>Part-of-Speech (POS) tagging</b> to identify the role of each word in a given sentence. |   |
| Unit II  | Language Syntax and Semantics   | (08 Hrs.)   |
| Morphological Analysis: What is Morphology? Types of Morphemes, Inflectional morphology & Derivational morphology, Morphological parsing with Finite State Transducers (FST) Syntactic Analysis: Syntactic Representations of Natural Language, Parsing Algorithms, Probabilistic context-free grammars, and Statistical parsing Semantic Analysis: Lexical Semantic, Relations among lexemes & their senses – Homonymy, Polysemy, Synonymy, Hyponymy, WordNet, Word Sense Disambiguation (WSD), Dictionary based approach, Latent Semantic Analysis |   |   |
| <b>Case Studies</b>  | Analyze the morphology of Hindi/Marathi words to develop a bilingual dictionary for English-Hindi/Marathi translation.  |   |
| Unit III   | Language Modelling  | (08 Hrs.)   |

|   |   |                  |
|---|---|------------------|
| Probabilistic language modeling, Markov models, Generative models of language, Log-Liner Models, Graph-based Models N-gram models: Simple n-gram models, Estimation parameters and smoothing, Evaluating language models, Word Embedding's/ Vector Semantics: Bag-of-words, TFIDF, word2vec, doc2vec, Contextualized representations (BERT) Topic Modelling: Latent Dirichlet Allocation (LDA), Latent Semantic Analysis, Non Negative Matrix Factorization |   |                  |
| <b>Case Studies</b>   | Evaluate a learner's vocabulary by predicting missing words in sentences by using Masked language modeling (e.g., BERT-style) |                  |
| <b>Unit IV</b>  | <b>Information Retrieval using NLP</b>  | <b>(08 Hrs.)</b> |
| Information Retrieval: Introduction, Vector Space Model Named Entity Recognition: NER System Building Process, Evaluating NER System Entity Extraction, Relation Extraction, Reference Resolution, Coreference resolution, Cross Lingual Information Retrieval  |   |                  |
| <b>Case Studies</b>   | Implement a keyword-based retrieval system that matches user queries with both exact terms and their synonyms.                |                  |
| <b>Unit V</b>   | <b>NLP Tools and Techniques</b>   | <b>(08 Hrs.)</b> |
| Natural Language Tool Kit (NLTK), spaCy, TextBlob, Gensim etc. Linguistic Resources: Lexical Knowledge Networks, WordNets, Indian Language WordNet (IndoWordnet), VerbNets, PropBank, Treebanks, Universal Dependency Treebanks Word Sense Disambiguation: Lesk Algorithm Walker's algorithm, WordNets for Word Sense Disambiguation  |   |                  |
| <b>Case Studies</b>   | Use <b>NLTK</b> to perform tokenization, stopwords removal, stemming, and lemmatization.                                      |                  |

| Learning Resources  |  |
|---|--|
| <b>Text Books:</b>  |  |
| <ol style="list-style-type: none"> <li>1. Daniel Jurafsky, James H. Martin, "Speech and Language Processing", Second Edition, Prentice Hall, 2008.</li> <li>2. Christopher D.Manning and Hinrich Schutze,, "Foundations of Statistical Natural Language Processing", MIT Press, 1999</li> </ol> |  |
| <b>Reference Books:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Steven Bird,Ewan Klein and Edward Loper," NLP with Python:Analyzing text with the Natural Language Toolkit", O'Reilly Media,Inc</li> </ol>  |  |
| <b>e-Books:</b>   |  |
| Yoav Goldberg. A primer on neural network models for natural language processing, 2015.<br>URL <a href="http://u.cs.biu.ac.il/~yogo/nnlp.pdf">http://u.cs.biu.ac.il/~yogo/nnlp.pdf</a>  |  |
| <b>MOOC Courses:</b>  |  |
| <a href="https://onlinecourses.nptel.ac.in/noc23_cs45/preview">https://onlinecourses.nptel.ac.in/noc23_cs45/preview</a>   |  |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| <b>CO1</b>               | 2   | 2   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 3    | 1    | 2    |
| <b>CO2</b>               | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | -   | -    | -    | 1    | 3    | 1    | 2    |
| <b>CO3</b>               | 2   | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -    | -    | 2    | 3    | 2    | 1    |
| <b>CO4</b>               | 2   | 2   | 3   | 3   | 3   | -   | 2   | -   | -   | -    | -    | 3    | 3    | 2    | 2    |
| <b>CO5</b>               | 2   | 2   | 3   | 3   | 3   | -   | -   | -   | -   | -    | -    | 3    | 3    | 1    | 2    |
| <b>CO6</b>               | 3   | 3   | 3   | 3   | 3   | 2   | 1   | -   | -   | -    | -    | 3    | 1    | 1    | 2    |



**Matoshri College of Engineering & Research Centre, Nasik**  
**Master of Computer Application (2024-25)**  
**Second Year MCA**  
**24P1519 Program Elective Course-3**  
**24P1519-C : Advanced Java**

| Teaching Scheme  | Credit   | Examination Scheme                                      |
|--|--|---|
|  |  | Examination Scheme & Marks                              |
| TH: 04 Hours/Week  | 04   | ISE:<br>CAT: 20 Marks<br>CCE: 20 Marks<br>ESE: 60 Marks |
| <b>Prerequisite:</b> Concepts of Java language   |  |   |
| <b>Companion Course, if any: Programming Lab 3 (24P1519)</b>   |  |   |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To learn the core concept of Java programming.</li> <li>To introduce the working environment of Java Program using the multithreading and file handling.</li> <li>To get acquainted the purpose of applet and AWT in Java programming.</li> <li>To study the use of database connectivity in Java Programming.</li> <li>To gain knowledge of Java Servlet and JSP concept in Java.</li> </ul> |  |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–  |  | <b>BL</b>   |
| <b>CO1:</b> Demonstrate proficiency in multithreading.   |  | <b>3</b>  |
| <b>CO2:</b> Illustrate the purpose of applet and AWT in Java programming.  |  | <b>3</b>  |
| <b>CO3:</b> Design and develop robust backend systems using Java Programming.  |  | <b>5</b>  |
| <b>CO4:</b> Implement Java Servlet and JSP concept in Java.  |  | <b>3</b>  |
| <b>CO5:</b> Implement full-stack applications to cloud platforms.  |  | <b>3</b>  |
| <b>CO6:</b> Develop responsive and dynamic web interfaces using front-end technologies   |  | <b>5</b>  |
| <b>Course Contents</b>   |  |   |
| <b>Unit I</b>  | <b>Multithreading and File Handling</b>  | <b>( 08 Hrs.)</b>                                       |
| Multithreading: Multithreading concepts, Thread Life cycle, Creating multithreaded application, Thread priorities, Thread synchronization, Java Input Output: Java IO package Byte/Character Stream, Buffered reader / writer, File reader / writer, Print writer File Sequential / Random   |  |   |
| <b>Case Studies</b>  | Use <b>Java threads</b> to download multiple files from the internet at the same time. Each file can take a different amount of time to download, and they want to ensure the program doesn't block while downloading. |   |
| <b>Unit II</b>   | <b>Applets</b>   | <b>(08 Hrs.)</b>  |
| Applet As Java Applications: Life cycle of Applet, Creation and Execution of Java Applets, Displaying it using Web Browser with appletviewer.exe, Advantages and Disadvantages of Applet Vs Applications, Parameter Passing to applet  |  |   |
| <b>Case Studies</b>  | Create an Applet that loads and displays an image when the applet is loaded. The applet should also display a message if the image fails to load.  |   |
| <b>Unit III</b>  | <b>AWT Programming</b>   | <b>(08 Hrs.)</b>  |



|  |   |                  |
|--|---|------------------|
| Abstract Windows Toolkit: Components and Graphics, Containers, Frames and Panels, Layout Managers, AWT basic components, Event delegation Model: Event source and handler, Event categories, Listeners, interfaces, Anonymous classes, Swing Libraries: Model view Controller design pattern, Different layout, menus dialog boxes, Text input |   |                  |
| <b>Case Studies</b>  | Design a login form using AWT components where the user can enter a username and password. The form should validate if both fields are filled and show a message accordingly. |                  |
| <b>Unit IV</b>   | <b>JDBC</b>   | <b>(08 Hrs.)</b> |
| Java database connectivity, Types of JDBC drivers, Writing first JDBC applications, Types of statement objects (Statement, Prepared Statement and CallableStatement), Types of resultset, Result Set Metadata, Inserting and updating records, JDBC and AWT, Connection pooling  |   |                  |
| <b>Case Studies</b>  | Connect any application with the back end database using JDBC.  |                  |
| <b>Unit V</b>  | <b>Java Servlet and JSP</b>   | <b>(08 Hrs.)</b> |
| Servlet: Introduction, Life cycle of servlet, Handling HTTP Get Request, Handling HTTP Post Request, Introduction to JSP: Getting Familiar with JSP Server, First JSP, Adding Dynamic contents via expressions, Scriptlets, Mixing Scriptlets and HTML, Directives, Declaration, Tags and Session  |   |                  |
| <b>Case Studies</b>  | Create a simple shopping cart application where a user can add items to the cart and view the cart details in a summary page.   |                  |

| Learning Resources  |  |
|---|--|
| <b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Programming with Java , A primer ,Fourth edition , By E. Balagurusamy</li> <li>2. Herbert Schilt, “JAVA Complete Reference”, 7th Edition, Tata McGraw Hill, ISBN: 9780070636774</li> </ol>   |  |
| <b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Eckel B., "Thinking in Java", 3rd Edition, Pearson Education</li> <li>2. “Complete Reference Java” by Herbert Schildt (5th edition)</li> <li>3. Core Java 2 Volume - I Cay S Horstmann, Fary Cornell</li> </ol>                         |  |
| <b>e-Books:</b><br><a href="https://link.springer.com/shop/apress/java-books/en-eu/">https://link.springer.com/shop/apress/java-books/en-eu/</a>  |  |
| <b>MOOC Courses:</b> <ol style="list-style-type: none"> <li>1. <a href="https://moocfi.github.io/courses/2013/programming-part-1/">https://moocfi.github.io/courses/2013/programming-part-1/</a></li> <li>2. <a href="https://java-programming.mooc.fi/">https://java-programming.mooc.fi/</a></li> </ol> |  |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1                      | 3   | 3   | 2   | 2   | 3   | 1   | 2   | 1   | 2   | -    | 1    | 1    | 3    | 3    | 2    |
| CO2                      | 3   | 2   | 2   | 1   | 3   | 1   | 2   | 1   | 2   | -    | 1    | 1    | 2    | 3    | 2    |
| CO3                      | 3   | 3   | 3   | 2   | 3   | 1   | 2   | 2   | 2   | 1    | 2    | 2    | 3    | 3    | 3    |
| CO4                      | 3   | 3   | 3   | 2   | 3   | 1   | 2   | 2   | 2   | 1    | 2    | 2    | 3    | 3    | 3    |
| CO5                      | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 3   | 3   | 1    | 3    | 3    | 3    | 3    | 3    |
| CO6                      | 3   | 3   | 3   | 2   | 3   | 1   | 2   | 2   | 3   | -    | 2    | 2    | 3    | 3    | 3    |



**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application (2024-25)**  
**Second Year MCA**  
**24P1519 Program Elective Course-3**  
**24P1519-D: Deep Learning**

| Teaching Scheme  | Credit   | Examination Scheme                                      |
|--|--|---|
| TH: 04 Hours/Week  | 04   | ISE:<br>CAT: 20 Marks<br>CCE: 20 Marks<br>ESE: 60 Marks |
| <b>Prerequisite:</b> Machine Learning  |  |   |
| <b>Companion Course, if any: Programming Lab 3(24P1519)</b>  |  |   |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To understand the basics of deep learning.</li> <li>To understand the Recurrent and Recursive nets in deep learning.</li> <li>To design and develop an application-specific deep learning model.</li> <li>To provide the practical knowledge handling and analyzing real world applications.</li> </ul> |  |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–  |  | <b>BL</b>   |
| <b>CO1:</b> Demonstrate the basics of deep learning and apply the tools to implement deep learning applications  |  | <b>3</b>  |
| <b>CO2:</b> Evaluate the performance of deep learning models.  |  | <b>6</b>  |
| <b>CO3:</b> Apply the technique of Convolution (CNN) and Recurrent Neural Network (RNN) for implementing Deep Learning models  |  | <b>3</b>  |
| <b>CO4:</b> Design and implement deep generative models  |  | <b>5</b>  |
| <b>CO5 :</b> Construct and apply on-policy reinforcement learning algorithms   |  | <b>3</b>  |
| <b>CO6:</b> Illustrate Representation Learning and Transfer Learning techniques using variants of CNN architecture.  |  | <b>3</b>  |
| <b>Course Contents</b>   |  |   |
| <b>Unit I</b>  | <b>Fundamentals of Deep Learning</b>   | <b>(08 Hrs.)</b>  |
| What is Deep Learning?, Multilayer Perceptron ,Feed forward neural, Back propagation, Gradient descent, Vanishing gradient problem, Activation Functions: RELU, LRELU, ERELU, Optimization Algorithms, Hyper parameters: Layer size, Magnitude (momentum, learning rate),Regularization (dropout, drop connect, L1, L2)  |  |   |
| <b>Case Studies</b>  | Train a deep feedforward neural network with sigmoid activations on the MNIST dataset. Explore Vanishing Gradient Problem with Sigmoid |   |
| <b>Unit II</b>   | <b>Recurrent Neural Networks</b>   | <b>(08 Hrs.)</b>  |
| Recurrent Neural Networks: Types of Recurrent Neural Networks, Feed-Forward Neural Networks vs Recurrent Neural Networks, Long Short-Term Memory Networks (LSTM), Encoder Decoder architectures, Recursive Neural Networks   |  |   |
| <b>Case Studies</b>  | Train an RNN to predict the next character in a string using a dataset of text (e.g., Shakespeare's works).                            |   |
| <b>Unit III</b>  | <b>Convolutional Neural Network</b>  | <b>(08 Hrs.)</b>  |
| Introduction to CNN, Convolution Operation, Parameter Sharing, Equivariant Representation, Pooling, Variants of the Basic Convolution Function, The basic Architecture of CNN, Popular CNN Architecture – AlexNet.   |  |   |

|  |   |                  |
|--|---|------------------|
| <b>Case Studies</b>  | Use a CNN to classify images of animals into categories: cats, dogs, and birds. into one of the three categories.   |                  |
| <b>Unit IV</b>   | <b>Representation Learning</b>  | <b>(08 Hrs.)</b> |
| Greedy Layer wise Pre-training, Transfer Learning and Domain Adaption, Distributed Representation, Variants of CNN: DenseNet.                            |   |                  |
| <b>Case Studies</b>  | Use a pre-trained model like <b>DeepSpeech</b> or <b>Wav2Vec2.0</b> and fine-tune it on the small dataset of call center audio to improve transcription accuracy. |                  |
| <b>Unit V</b>  | <b>Applications of Deep Learning</b>  | <b>(08 Hrs)</b>  |
| Overview of Deep Learning Applications: Image Classification, Social N/w/ analysis, Speech Recognition, Recommender system, Natural Language Processing. |   |                  |
| <b>Case Studies</b>  | Face detection and recognition using deep learning.<br>Autonomous Vehicle Navigation  |                  |

| Learning Resources   |  |
|--|--|
| <b>Text Books:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017</li> <li>2. Nikhil Buduma, "Fundamentals of Deep Learning Designing Next-Generation Machine Intelligence Algorithms" O'Reilly</li> </ol>  |  |
| <b>Reference Books:</b>  |  |
| <ol style="list-style-type: none"> <li>1. Umberto Michelucci "Applied Deep Learning. A Case-based Approach to Understanding.</li> <li>2. Deep Neural Networks" Apress, 2018.</li> <li>3. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012.</li> </ol>  |  |
| <b>e-Books:</b>  |  |
| Michael Nielsen, "Neural Networks and Deep Learning", Online book, 2016<br>( <a href="http://neuralnetworksanddeeplearning.com/">http://neuralnetworksanddeeplearning.com/</a> )   |  |
| <b>MOOC Courses:</b>   |  |
| <ol style="list-style-type: none"> <li>1. Deep Learning - IIT Ropar <a href="https://onlinecourses.nptel.ac.in/noc22_cs35/">https://onlinecourses.nptel.ac.in/noc22_cs35/</a></li> <li>2. Introduction to Deep Learning : <a href="https://www.coursera.org/learn/introduction-to-deep-learning-boulder">https://www.coursera.org/learn/introduction-to-deep-learning-boulder</a></li> </ol> |  |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| <b>CO1</b>               | 3   | 3   | 2   | 2   | 1   | 3   | 1   | 2   | 1   | 2    | -    | 1    | 1    | 3    | 2    |
| <b>CO2</b>               | 2   | 3   | 3   | 2   | 3   | 1   | 2   | 2   | 2   | 1    | 1    | 1    | 3    | 3    | 2    |
| <b>CO3</b>               | 3   | 3   | 3   | 2   | 3   | 1   | 2   | 2   | 2   | -    | 2    | 2    | 3    | 3    | 3    |
| <b>CO4</b>               | 3   | 3   | 3   | 3   | 3   | 1   | 2   | 2   | 2   | 1    | 2    | 3    | 3    | 3    | 3    |
| <b>CO5</b>               | 3   | 3   | 2   | 3   | 3   | 1   | 1   | 2   | 2   | 1    | 1    | 2    | 3    | 3    | 3    |
| <b>CO6</b>               | 3   | 3   | 3   | 2   | 3   | 1   | 2   | 1   | 2   | -    | 2    | 2    | 3    | 3    | 3    |

**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application (2024-25)**  
**Second Year MCA**  
**24P1520: Programming Laboratory 3**

| Teaching Scheme   | Credit | Examination Scheme             |
|-------------------|--------|--------------------------------|
|                   |        | Examination Scheme & Marks     |
| TH: 02 Hours/Week | 1      | ISE: 20 Marks<br>ESE: 30 Marks |

**Prerequisite: Python Programming (24P1503)**

**Companion Course, if any: Program Elective Course -3 (24P1519)**

**Course Objectives:**

1. Design and evaluate the performance of a different machine learning models.
2. To learn to interface of sensor and actuators using Arduino Uno/Raspberry Pi
3. To learn and understand IoT platforms and its significance for real time applications
4. To understand the fundamental concepts and techniques of natural language processing (NLP)
5. To understand the concepts of full-stack java development
6. To formulate deep learning problems corresponding to different applications.

**Course Outcomes:** On completion of the course, learner will be able to **BL**

**CO1: Recognize** the characteristics of machine learning that makes it useful to real-world problems and apply different dimensionality reduction techniques. **2**

**CO2: Design** and implement real time applications with sensors and actuators. **5**

**CO3: Design** and deploy real-world NLP applications i **5**

**CO4: Design** Full-Stack Applications **5**

**CO5: Construct** and train a deep Neural Network models for use in various applications. **3**

**CO6: Apply** theoretical knowledge to real-world scenarios by engaging in experiential learning activities such as high-end equipment demonstrations, participating in industry visits, and organizing or participating in technical events so as to imbibe problem-solving skills, foster innovation, and build professional competencies necessary for successful careers in engineering. **3**

**Guidelines for Instructor's Manual**

The faculty member should prepare the laboratory manual for all the experiments and it should be made available to students and laboratory instructor/Assistant.

- **Industry 4.0 and Industrial Internet of things**
- **Programming Language :** Python
- **Natural Language Processing**
- **Operating System recommended:** - 64-bit Open source Linux or its derivative
- **Programming Languages:** C++/JAVA/PYTHON/R
- **Programming tools recommended:** Front End: Java/Perl/PHP/Python/Ruby/.net
- **Backend:** MongoDB/MYSQL/Oracle, Database Connectivity: ODBC/JDBC
- **Additional Tools:** Octave, Matlab, WEKA, PowerBI
- **Advanced Java**
- **Programming Language:** Java

**Guidelines for Students Lab Journal**

1. Students should submit term work in the form of a handwritten journal based on a specified list of assignments.
2. Practical Examination will be based on the term work.
3. Students are expected to know the theory involved in the experiment.
4. The practical examination should be conducted if and only if the journal of the candidate is complete in all respects

**Guidelines for Lab /TW Assessment**

1. Examiners will assess the term work based on performance of students considering the parameters such as timely conduction of practical assignment, methodology adopted for implementation of practical assignment, timely submission of assignment in the form of handwritten write-up along with results of implemented assignment, attendance etc.
2. Examiners will judge the understanding of the practical performed in the examination by asking some questions related to theory & implementation of experiments he/she has carried out.
3. Appropriate knowledge of usage of software and hardware related to respective laboratories should be as a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers of the program in a journal may be avoided. There must be hand-written write-ups for every assignment in the journal. The DVD/CD containing student programs should be attached to the journal by every student and the same to be maintained by the department/lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

**Guidelines for Laboratory Conduction**

1. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic.
2. The instructor may frame multiple sets of assignments and distribute them among batches of students.
3. All the assignments should be conducted on multicore hardware and 64-bit open-sources software

**Guidelines for Practical Examination**

1. Both internal and external examiners should jointly set problem statements for practical examination. During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement.
2. The supplementary and relevant questions may be asked at the time of evaluation to judge the student's understanding of the fundamentals, effective and efficient implementation.
3. The evaluation should be done by both external and internal examiners.

**Suggested List of Laboratory Assignments (Instructor may design a newer one)****Programming Laboratory 3(24P1520)****Group A - Machine Learning (24P1517)**

| Sr. No | Experiments / Assignments  | CO          |
|--------|--|-------------|
| 1      | Download heart dataset from the following link.<br><a href="https://www.kaggle.com/zhaoyingzhu/heartcsv">https://www.kaggle.com/zhaoyingzhu/heartcsv</a><br>Perform the following operation on a given dataset.<br>a)Find Shape of Data<br>b)Find Missing Values<br>c)Find data type of each column<br>d)Finding out Zero's<br>e)Find Mean age of patients<br>f) Now extract only Age, Sex, ChestPain, RestBP, Chol. Randomly divide the dataset in training (75%) and testing (25%).<br>Create confusion matrix based on above data and find<br>I. Accuracy II. Precision III. Recall IV. F-1 score | CO1,<br>CO6 |
| 2      | Assignment on Regression technique<br>Given a set of sample points in N dimensional feature space. Write a program to fit the points with a hyper plane using Linear Regression. Calculate sum of residual error.  | CO1,<br>CO6 |
| 3      | Write a program that provides option to compute different distance measures between two points in the N dimensional feature space. Consider some sample datasets for computing distances among sample points.  | CO1,<br>CO6 |

| 4   | Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Python ML library classes can be used for this problem.  | CO1,<br>CO6 |
|---|--|-------------|
| 5   | Write a program to implement K means clustering algorithm. Select your own dataset to test the program. Demonstrate the nature of output with varying value of K.  | CO1,<br>CO6 |
| <b>Group B-Program Elective Course - 3(24P1519)</b><br><b>Industry 4.0 And Industrial Internet Of Things(24P1519-A)</b> |  |             |
| Sr. No  | Experiments / Assignments  | CO          |
| 1   | Design and implement an IoT system using Arduino Uno/ Raspberry Pi using 'Ultrasonic sensor and Servo motor' such as 'Door opener in home automation'.   | CO2,<br>CO6 |
| 2   | Design and implement parameter monitoring IoT system keeping records on Cloud such as 'environment humidity and temperature monitoring'.   | CO2,<br>CO6 |
| 3   | Design and implement a real time monitoring system using android phone (Blynk App.) such as 'soil parameter monitoring'.   | CO2,<br>CO6 |
| 4   | Design and implement IoT system for one of the applications like: Traffic Application, Medical/Health application, Social Application etc.   | CO2,<br>CO6 |
| <b>Group B-Program Elective Course - 3(24P1519)</b><br><b>Natural Language Processing(24P1519-B)</b>                    |  |             |
| Sr. No  | Experiments / Assignments  | CO          |
| 1   | Perform tokenization (Whitespace, Punctuation-based, Treebank, Tweet, MWE) using NLTK library. Use porter stemmer and snowball stemmer for stemming. Use any technique for lemmatization. Input / Dataset –use any sample sentence   | CO3,<br>CO6 |
| 2   | Perform bag-of-words approach (count occurrence, normalized count occurrence), TF-IDF on data. Create embeddings using Word2Vec.<br>Dataset to be used: <a href="https://www.kaggle.com/datasets/CooperUnion/cardataset">https://www.kaggle.com/datasets/CooperUnion/cardataset</a>  | CO3,<br>CO6 |
| 3   | Perform text cleaning, perform lemmatization (any method), remove stop words (any method), label encoding. Create representations using TF-IDF. Save outputs. Dataset: <a href="https://github.com/PICT-NLP/BE-NLP-Elective/blob/main/3Preprocessing/News_dataset.pickle">https://github.com/PICT-NLP/BE-NLP-Elective/blob/main/3Preprocessing/News_dataset.pickle</a> | CO3,<br>CO6 |
| 4   | Create a transformer from scratch using the Pytorch library  | CO3,<br>CO6 |
| <b>Group B-Program Elective Course - 3(24P1519)</b><br><b>Advanced Java (24P1519-C)</b>                                 |  |             |
| Sr. No  | Experiments / Assignments  | CO          |
| 1   | Set up Java Programming development environment by using<br>i. Command Prompt<br>ii. Any IDE like Eclipse, Notepad++, JCreator etc.<br>And Test Java Programming development environment by implementing a small program   | CO4,<br>CO6 |
| 2   | Write a program to implement student information in a file and perform the operations on it  | CO4,<br>CO6 |
| 3   | Write a multithreaded Java program to simulate a bank transaction system.  | CO4,<br>CO6 |
| 4   | Build a back-end application to manage employee data, integrating Hibernate for database interactions.   | CO4,<br>CO6 |
| 5   | Write a program to chat between client and server  | CO4,<br>CO6 |
| 6   | Implement user authentication and authorization using Spring Security and JWT in a full-stack application.   | CO4,<br>CO6 |



|  |   |           |
|--|---|-----------|
| 7  | Design a job portal where users can register, post job listings, and apply for jobs, including an admin panel for management.   | CO4, CO6  |
| <b>Group B-Program Elective Course - 3(24P1519)</b><br><b>Deep Learning(24P1519-D)</b>   |   |           |
| <b>Sr. No.</b>   | <b>Experiments / Assignments</b>  | <b>CO</b> |
| 1  | Study of Deep learning Packages: Tensor flow, Keras, Theano and PyTorch. Document the distinct features and functionality of the packages.                              | CO5, CO6  |
| 2  | To implement a Multilayer Perceptron (MLP) using Keras with Tensor Flow, and fine-tune neural network hyper parameters for regression problem (house price prediction). | CO5, CO6  |
| 3  | To implement a MLP using keras with Tensor Flow for classification problem (heart disease predication).   | CO5, CO6  |
| 4  | To implement a Convolution Neural Network (CNN) for dog/cat classification problem using keras  | CO5, CO6  |
| 5  | To implement a Recurrent Neural Network (RNN) for predicating time series data.   | CO5, CO6  |
| 6  | To implement a Long Short-Term Memory (LSTM) for predicating time series data.  | CO5, CO6  |
| 7  | To implement a Gated Recurrent Unit (GRU) for time series data predication.   | CO5, CO6  |
| <b>Short Term Project</b>  |   |           |
| <b>Learning Resources</b>  |   |           |
| <b>Text Books:</b>   |   |           |
| 1. Ethem Alpaydin, Introduction to Machine Learning, PHI 2nd Edition-2013<br>2. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.<br>3. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach” , 2014,Universities Press (India) Pvt Ltd., ISBN: 9788173719547<br>4. Matt Richardson & Shawn Wallac, “Getting Started with Raspberry Pi”, 2014, O'Reilly (SPD), ISBN: 9789350239759<br>5. Steven Bird,Ewan Klein and Edword Loper,” NLP with Python:Analyzing text with the Natural Language Toolkit”, O'Reilly Media,Inc<br>6. Programming with Java , A primer ,Fourth edition , By E. Balagurusamy<br>7. Herbert Schilt, “JAVA Complete Reference”, 7th Edition, Tata McGraw Hill, ISBN:9780070636774 |   |           |

| <b>The CO-PO Mapping Matrix</b> |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|---------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                           | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1                             | 3   | 3   | -   | -   | 3   | -   | -   | -   | -   | -    | -    | 2    | 3    | 1    | 2    |
| CO2                             | 3   | 2   | 2   | 2   | 1   | -   | -   | -   | -   | -    | -    | -    | 3    | 1    | 2    |
| CO3                             | 3   | 2   | 2   | 2   | 2   | -   | 1   | -   | -   | -    | -    | -    | 3    | 2    | 1    |
| CO4                             | 1   | 2   | 1   | 1   | 2   | -   | 1   | -   | -   | -    | -    | -    | 3    | 2    | 2    |
| CO5                             | 2   | 2   | 3   | 2   | 2   | -   | -   | -   | -   | -    | -    | -    | 3    | -    | 2    |
| CO6                             | 1   | 2   | 2   | 2   | 2   | -   | -   | -   | -   | -    | 2    | -    | 2    | 2    | 1    |





**Matoshri College of Engineering & Research Centre, Nashik**  
**Master of Computer Application (2024-25)**  
**Second Year MCA**  
**24P1521: Digital Marketing**

| Teaching Scheme  | Credit   | Examination Scheme                                  |
|--|--|---|
|  |  | Examination Scheme & Marks                          |
| <b>TUT: 1 Hour/Week</b>  | <b>01</b>  | <b>In Sem: 20 Marks</b><br><b>End_Sem: 30 Marks</b> |
| <b>Preamble:</b> This course provides an introduction to digital and social media marketing. It is built around a proven eight-step social media planning model provides you with a cumulative learning experience, showing you how to construct social media strategies that achieve desired marketing goals. These marketing goals shape the development of tailored social media strategies. Special attention is given to the most effective techniques for identifying targeted marketing on the social web, with emphasis on the creation of personas that represent the critical online market segments for a company. You will discover how to put these well-defined personas to work in selecting the optimal social media platforms for reaching an organization's marketing goals. With these guidelines in mind, the most productive marketing tactics for each type of major social media platform are examined in depth. These platform-specific tactics are brought together to create a comprehensive social media marketing plan, with detailed explanations and illustrations from a real world plan. |  |   |
| <b>Course Objectives:</b> Understand the landscape of traditional, digital, and social media marketing   |  |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–  |  | <b>BL</b>   |
| <b>CO1: Understand</b> the core concepts of Digital Marketing.   |  | <b>2</b>  |
| <b>CO2: Illustrate</b> the core concepts of Online Marketing.  |  | <b>3</b>  |
| <b>CO3: Comprehend</b> the concept of Digital marketing using social media.  |  | <b>2</b>  |
| <b>CO4: Comprehend</b> the Social Media Analytics strategies.  |  | <b>2</b>  |
| <b>CO5: Apply</b> the fundamental principles and concepts of Search Engine Optimization(SEO).  |  | <b>3</b>  |
| <b>CO6: Generate</b> actionable insights to optimize marketing strategies.   |  | <b>5</b>  |
| <b>Course Contents</b>   |  |   |
| <b>Unit I</b>  | <b>Introduction to Digital marketing</b>                                     | <b>(05 Hrs.)</b>                                    |
| Introduction to Digital marketing, The Concept, Need & Evolution of Digital Marketing, Reason for growing importance of Digital Marketing in India, Digital Marketing: Types & Examples.   |  |   |
| <b>Case Study</b>  | YouTube Marketing Campaign to Boost Product Awareness                        |   |
| <b>Unit II</b>   | <b>Online Marketing</b>  | <b>(05 Hrs.)</b>                                    |
| The concept of Digital Marketing Mix, 7 P's of Online Marketing: Product, Price, Promotion, Place People, Process, Physical evidence, Methods of Online Marketing promotion.   |  |   |
| <b>Case Study</b>  | Promotion of online learning courses.  |   |
| <b>Unit III</b>  | <b>Introduction to Social Media Marketing</b>                                | <b>(05 Hrs.)</b>                                    |
| Consumer Generated Contents (CGC), Impact of Social Media, Advantages and Disadvantages of Social Media, Types of Social Media, Social Media for Business use, Community Building Principles   |  |   |
| <b>Case Study</b>  | Understand the strategies used in various products differ across industries. |   |

| Unit IV   | Social Media Analytics  | (05 Hrs.) |
|---|---|-----------|
| Types of Analytics in Social Media: Analytics, Listening, Advertising Analytics, Analytics from CMS and CRM, The Analytics Process, Metrics, Dashboards, and Reports. |   |           |
| <b>Case Study</b>   | Identify that posts with influencer collaborations had the highest engagement in any brand. |           |
| Unit IV   | Search Engine Optimization(SEO)   | (05 Hrs.) |
| Search Engine Optimization Basics, Keyword Research, SEO Tool- SEMrush: Overview and Features, Top Search Engine Ranking Factors.                                     |   |           |
| <b>Case Study</b>   | Dominos India: Building Traffic through content propagation.                                |           |

| Learning Resources   |
|--|
| <b>Text Books:</b><br>Digital Marketing, Dave Chaffey, Fiona Ellis-Chadwick                                  |
| <b>Reference Books:</b><br>Digital Marketing An Overview, Dr. Antony Puthussery                              |
| <b>e-Books:</b><br><a href="https://nptel.ac.in/courses/110104070">https://nptel.ac.in/courses/110104070</a> |

| The CO-PO Mapping Matrix |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO\PO                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| <b>CO1</b>               | 3   | 2   | 1   | -   | 1   | 1   | 2   | -   | 2   | 1    | 1    | 1    | 3    | 2    | 2    |
| <b>CO2</b>               | 2   | 3   | 2   | 1   | 2   | 1   | 2   | 2   | 3   | 1    | 2    | 1    | 3    | 3    | 2    |
| <b>CO3</b>               | 3   | 3   | 3   | 2   | 3   | 2   | 3   | 3   | 2   | 2    | 3    | 2    | 3    | 3    | 3    |
| <b>CO4</b>               | 2   | 3   | 3   | 3   | 3   | 1   | 2   | 3   | 3   | 2    | 3    | 3    | 3    | 3    | 3    |
| <b>CO5</b>               | 3   | 3   | 3   | 2   | 2   | 1   | 2   | 2   | 2   | 1    | 2    | 2    | 2    | 3    | 2    |
| <b>CO6</b>               | 3   | 3   | 2   | 3   | 3   | 2   | 3   | 3   | 3   | 2    | 3    | 3    | 3    | 3    | 3    |



| <b>Matoshri College of Engineering &amp; Research Centre, Nashik</b><br><b>Master of Computer Application (2024-25)</b><br><b>Second Year MCA</b><br><b>24P1522: Project Stage -I</b>   |          |  |
|---|----------|--|
| Teaching Scheme   | Credit   | Examination Scheme   |
|   |          | Examination Scheme & Marks   |
| <b>PR: 12 hours/week</b>  | <b>6</b> | <b>ISE:</b><br><b>CAT: 40 Marks</b><br><b>CCE: 40 Marks</b><br><b>ESE: 120 Marks</b> |
| <b>Prerequisite:</b> Basics Programming(C,C++, JAVA, etc) , DBMS(MS-Access, MySql, Oracle etc.) , Software Engineering  |          |  |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To identify and solve problems considering social, ethical and legal issues</li> <li>To enhance analytical and computational skills</li> <li>To inculcate leadership and managerial skills through team work.</li> <li>To understand software/system development life cycle</li> <li>To gain insight of testing and deployment of applications</li> </ul>                              |          |  |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–   |          | <b>BL</b>  |
| <b>CO1: Analyze</b> and solve problems by applying programming knowledge  |          | <b>4</b>   |
| <b>CO2: Prepare</b> requirements and Design Documents   |          | <b>5</b>   |
| <b>CO3: Develop</b> Interpersonal and leadership qualities  |          | <b>5</b>   |
| <b>CO4: Demonstrate</b> system with results and interpretation  |          | <b>3</b>   |
| <b>CO5: Describe</b> software testing methods   |          | <b>2</b>   |
| <b>CO6: Design</b> and develop technical documentation  |          | <b>5</b>   |
| Course Execution details  |          |  |
| <b>1. Formulation of Team and Topic Finalization:</b><br>Students should form a group of 3 to 4 members. Staff and Students should discuss the relevant problem statement. (Prefer real world problems having some social impact and application) Each team should be allocated a guide. Students should submit Synopsis (should contain Flowchart, Usage of the logic, algorithm, functions and suitable data structure for implementing the solution) |          |  |
| <b>2. Development</b><br>Select any suitable programming platform (Open source, window, web, mobile applications or any other suitable) Prefer open source technologies for development. Students can select any programming language they have learnt or in which they are competent.  |          |  |
| <b>3. Design and Documentation</b><br>SDLC has to be followed for design and development Prepare Analysis Specification Document, Input Specification and Design Specification Documents (use Data Design, DFD, Flowcharts, UML diagrams, Data Dictionary, ER dig etc.) Follow SDD, SRS Provide Test Specifications (test cases, test results, test methodology etc.) Report Generations if needed.   |          |  |
| <b>4. Report and Presentation</b> Students should present the working model of the project to the guide and panel of the college. They should prepare a report comprising the above mentioned terminologies. Submit Hard copy/Soft copy of the report which should contain certificate signed by guide, HOD and principal (prefer soft copy)  |          |  |
| Learning Resources  |          |  |
| <b>Reference Books:</b><br>1. “Software Engineering: A practitioner's approach” by Roger S Pressman   |          |  |

# SEMESTER IV



| <b>Matoshri College of Engineering and Research Centre (Autonomous)</b><br><b>Master of Computer Applications (MCA) (2024-25)</b><br><b>Second Year MCA</b><br><b>24P1523: Internship\$</b>   |           |  |
|---|-----------|--|
| Teaching Scheme   | Credit    | Examination Scheme                                   |
|   |           | Examination Scheme & Marks                           |
| <b>PR: 16 Hours/Week</b>  | <b>08</b> | <b>In_Sem: 80 Marks</b><br><b>End_Sem: 120 Marks</b> |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To encourage and provide opportunities for students to get professional/personal experience through internships.</li> <li>To learn and understand real life/industrial situations.</li> <li>To get familiar with various tools and technologies used in industries and their applications.</li> <li>To nurture professional and societal ethics.</li> <li>To create awareness of social, economic and administrative considerations in the working environment of industry organizations.</li> </ul>   |           |  |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–   |           | <b>BL</b>  |
| <b>CO1: Demonstrate</b> professional competence through industry internship.  |           | <b>3</b>   |
| <b>CO2: Apply</b> knowledge gained through internships to complete academic activities in a professional manner.  |           | <b>3</b>   |
| <b>CO3: Select</b> appropriate technology and tools to solve a given problem.   |           | <b>6</b>   |
| <b>CO4: Demonstrate</b> abilities of a responsible professional and use ethical practices in day to day life.   |           | <b>3</b>   |
| <b>CO5: Create</b> network and social circle, and developing relationships with industry people.  |           | <b>5</b>   |
| <b>CO6: Analyze</b> various career opportunities and decide carrier goals.  |           | <b>4</b>   |
| Guidelines  |           |  |
| <p>An internship is a period when students are trained in the skill they are good at and have the opportunity to apply their knowledge practically in industries. Internships are educational and career development opportunities, providing practical experience in a field or discipline. An internship broadens a student's knowledge base and horizon. Internships assist students in developing, enhancing, and applying their communication, leadership, problem-solving, and critical-thinking skills. It allows students to reflect on their professional experiences and demonstrate their potential, proficiency, and talents.</p> |           |  |
| <b>Duration:</b><br>Internship corresponding to major courses is to be completed after semester III examination and before commencement of semester IV of 180 hrs/ 6 weeks; and it is to be assessed and evaluated in semester IV. It is almost imperative that the commencement of Semester IV need to be approximately 3 weeks beyond the schedule.   |           |  |
| <b>Working as an intern:</b><br>An internship/Industrial training/project work is the form of experiential learning that integrates knowledge and theory learned in the classroom with practical application and skills development in a professional setting. The students can opt for internship/Industrial training/project work in any industry/academic institute/R&D/PSU/Government or semi-government organizations. Internship work identification process should be initiated in the IVth semester in coordination with training and placement cell/ industry institute cell/internship cell.  |           |  |
| <b>Internship record:</b><br>The students should maintain a worksheet which contains the daily task given by the supervisor. During internship students have to report to institute once in a two-week if students are doing it locally else they can report through mail or phone.   |           |  |

**Internship Work Evaluation through Seminar Presentation/Viva-Voce at the Institute:**

Every student is required to prepare a documentary proofs of the activities done by him as internship workbook. The evaluation of these activities will be done by Programme Head/Cell In-charge/ Project Head/ faculty mentor or Industry Supervisor based on- Overall compilation of internship activities, sub-activities, the level of achievement expected, evidence needed to assign the points and the duration for certain activities.

Assessment and Evaluation is to be done in consultation with internship supervisor (Internal and External – a supervisor from place of internship).

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

- Depth of knowledge and skills
- Communication & Presentation Skills
- Team Work
- Creativity
- Attendance record
- Diary/Work book

Student's Feedback from External Internship Supervisor

**Internship workbook may be evaluated on:**

- Proper and timely documented entries
- Adequacy & quality of information recorded
- Work done
- Organization of the information

**Feedback**

Post internship, faculty coordinator should collect feedback about student with recommended parameters include as- Technical knowledge, Discipline, Punctuality, Commitment, Willingness to do the work, Communication skill, individual work, Team work, Leadership.



| <b>Matoshri College of Engineering and Research Centre (Autonomous)</b><br><b>Master of Computer Applications (MCA) (2024-25)</b><br><b>Second Year MCA</b><br><b>24P1524:MOOC Course</b>  |        |   |
|--|--------|---|
| Teaching Scheme  | Credit | Examination Scheme  |
|  |        | Examination Scheme & Marks  |
| TH: 02 Hours/Week  | 02     | <b>ISE:</b><br><b>CAT: 20 Marks</b><br><b>CCE: 20 Marks</b><br><b>ESE: 60 Marks</b> |
| Guidelines   |        |   |
| <p>This course aims to create an excellent opportunity for students to acquire the necessary skill set for employability through massive online courses where the rare expertise of world famous experts from academics and industry are available.</p> <p>MOOCs (Massive Open Online Courses) provide an affordable and flexible way to learn new skills. MOOCs are courses delivered online and accessible to all for free. Massive because enrollments are unlimited and can run into hundreds of thousands. Open because anyone can enroll — that is, there is no admission process. Online because they are delivered via the internet. Course because their goal is to teach a specific subject. MOOCs typically comprise video lessons, readings, assessments, and discussion forums.</p> |        |   |
| Guidelines for conduction  |        |   |
| <p>MOOC course is compulsory. Marks will not be allotted if student is unable to complete MOOC course. Course Names will be declared as per availability of NPTEL courses of 12/16 weeks available in that particular year for the semester. Grades will be given on the basis of submitted assignments and marks obtained. If student wants to earn a verified certificate, he/she will have to fill the online exam registration form and take the proctored exam conducted by NPTEL/Spoken Tutorial in person at any of the designated exam centers.</p>  |        |   |
| Learning Resources:  |        |   |
| 1. Swayam- <a href="https://swayam.gov.in/">https://swayam.gov.in/</a><br>2. NPTEL- <a href="https://onlinecourses.nptel.ac.in/">https://onlinecourses.nptel.ac.in/</a><br>4. Mooc- <a href="http://mooc.org/">http://mooc.org/</a><br>5. Edx - <a href="https://www.edx.org/">https://www.edx.org/</a><br>6. Coursera- <a href="https://www.coursera.org/">https://www.coursera.org/</a>  |        |   |





**Matoshri College of Engineering and Research Centre (Autonomous)**  
**Master of Computer Applications (MCA) (2024-25)**  
**Second Year MCA**  
**24P1525: Skill Development Course**  
**(Data Analytic Tool)**

| Teaching Scheme          | Credit    | Examination Scheme  |
|--------------------------|-----------|---|
|                          |           | Examination Scheme & Marks  |
| <b>PR: 02 Hours/Week</b> | <b>02</b> | <b>ISE:</b><br><b>CAT: 10 Marks</b><br><b>CCE: 10 Marks</b><br><b>ESE: 30 Marks</b> |

**Guidelines**

The **Skill Development Course** aims to enhance individuals' abilities, knowledge, and expertise in a specific field, thereby improving their employability, productivity, and overall competence. These courses are typically designed to address practical skills and competencies that are relevant to industry needs or personal development. Through skill development, individuals can upgrade their existing qualifications, take on new roles, or shift to different career paths, thereby enhancing their long-term career prospects.

**Guidelines for conduction**

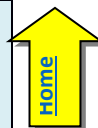
Students are required to complete and submit all the assignments that are outlined in the course syllabus. These assignments are integral to the learning process, as they are designed to help students reinforce their understanding of the course material, practice key concepts, and demonstrate their ability to apply theoretical knowledge to real-world problems. Grades will be given on the basis of submitted assignments and marks obtained. In addition to solving the problems, the quality of the presentation of the solution, including organization, logical flow, and the use of visual aids (such as graphs or tables), will also be considered in the evaluation. Specific weightage for each assignment will be given according to the complexity of the assignment. The final grade for the course will be based on the cumulative score from all assignments, and the marks allotted to each assignment will contribute proportionally to the overall grade.

**Submission Guidelines**

- Each assignment must be completed within the specified deadlines.
- Assignments should be submitted through the designated platform in the correct format (PDF, Word, etc.), as per the instructions provided.
- Any late submissions will incur penalties, as specified in the course policies, unless valid reasons are provided and approved by the instructor.
- Students should ensure that all assignments are their own work, and proper citations are included if external sources are referenced. Plagiarism will result in disqualification of the assignment.

**Suggested List of Assignments (Instructor may design a newer one)**

1. Perform an in-depth EDA on a given dataset to uncover patterns, relationships, and outliers.
2. Build a linear regression model to predict a numerical outcome based on independent variables.
3. Apply logistic regression for binary classification and assess model performance.
4. Forecast future values in a time series dataset using Exponential Smoothing.
5. Perform unsupervised clustering on a dataset using the K-means algorithm



| <b>Matoshri College of Engineering and Research Centre (Autonomous)</b><br><b>Master of Computer Applications (MCA) (2024-25)</b><br><b>Second Year MCA</b><br><b>24P1526:Project Stage-II</b>   |          |   |
|--|----------|---|
| Teaching Scheme  | Credit   | Examination Scheme                                    |
|  |          | Examination Scheme & Marks                            |
| <b>PR: 16 Hours/Week</b>   | <b>8</b> | <b>In_Sem: 100 Marks</b><br><b>End_Sem: 150 Marks</b> |
| <b>Companion Course, if any: 24P1523:Internship*</b>   |          |   |
| <b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To expose students to product development cycle using industrial experience, use of state of art technologies.</li> <li>Evaluate the various validation and verification methods.</li> <li>To Work in TEAM and learn professionalism</li> <li>To consolidate the work as furnished report.</li> <li>To apply communication skills to effectively promote ideas, goals or products.</li> </ul>   |          |   |
| <b>Course Outcomes:</b> On completion of the course, learner will be able to–  |          | <b>BL</b>   |
| <b>CO1: Execute</b> the research methodology with a concern for society, environment and ethics  |          | <b>3</b>  |
| <b>CO2: Apply</b> SDLC to project  |          | <b>3</b>  |
| <b>CO3: Analyze,</b> discuss and justify the results/trends and draw valid conclusions   |          | <b>4</b>  |
| <b>CO4: Recognize</b> the importance of documentation  |          | <b>2</b>  |
| <b>CO5:</b> Prepare the report as per recommended format and present the work orally adhering to stipulated time   |          | <b>3</b>  |
| <b>CO6: Apply</b> the knowledge to develop thermal Engineering Solution through experimentation and Modern tools and techniques.   |          | <b>3</b>  |
| <b>Guidelines</b>  |          |   |
| <p>An internship/Industrial training/Project work is the form of experiential learning that integrates Knowledge and theory learned in the classroom with practical application and skills development in a professional setting. The students can opt for internship/Industrial training/project work in any industry/academic institute/R&amp;D/PSU/Government or semi-government organizations. This caters students, the opportunity to gain valuable applied experience and explore networks in professional fields they are considering for career paths; and give employers the opportunity to guide and evaluate talent. This will not only help students in gaining professional know-how but also benefits, corporate on fresh perspectives on business issues and even discovering future business leaders.</p> |          |   |
| <b>Guidelines for conduction</b>   |          |   |
| <p>In Major Project with Industrial Internship, the student shall undergo industrial training and work on real life application as a project work. The student shall apply the Software Development Life Cycle to the project, draw design diagrams using tools, implement the system and test it before deployment. The student shall prepare and submit the report of Project work in standard format for satisfactory completion of the work that is the duly certified by the concerned guide and head of the Department/Institute. One sample copy should be submitted to the department in form of soft/hard copy</p>  |          |   |
| <ul style="list-style-type: none"> <li>Project work is monitored, and continuous assessment is done by guide and authorities.</li> </ul>   |          |   |

- | <ul style="list-style-type: none"><li>• Progress of project work is monitored regularly on weekly project slot/project day. Regular interval presentations are to be arranged to review and assess the work. During the process of monitoring and continuous assessment AND evaluation the individual and team performance is to be measured.</li><li>• During university examination internal examiner and External examiners jointly, evaluate the project work.</li><li>• Recommended performance measure parameters may include-Problem definition and scope of the project, Exhaustive and Rational Requirement Analysis, Comprehensive Implementation-Design, modelling, documentation, Usability, Optimization considerations (Time, Resources, Costing), Thorough Testing, Project Presentation and Demonstration (ease of use and usability), Presentation of work in the form of Project Report(s), understanding individual capacity, Role &amp; involvement in the project, among other parameters.</li><li>• The student shall prepare the duly certified final report of project work in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute.</li></ul> |
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