

## APPENDIX - CN

# MADURAI KAMARAJ UNIVERSITY

*(University with Potential for Excellence)*

## Revised Syllabus for Master of Computer Application (M.C.A.) Two Years Programme (CBCS – Semester Pattern) (With effect from the Academic Year 2023-2024 onwards)

### REGULATIONS AND SCHEME OF EXAMINATIONS

**1. Introduction of the Programme :** The course was designed to meet the growing demand for qualified professionals in the field of Information Technology. It is a postgraduate course that can be taken up after obtaining a Bachelor's Degree. Master of Computer Application (MCA) beset the study and application of computers and any form of data that store, retrieve and send information. The MCA programme is inclined more toward application development and thus has more emphasis on latest programming language and tools to develop better and faster applications. It includes a combination of hardware and software used together to perform the essential functions people need and use every day.

**2. Eligibility for Admission :** Admission Criteria as fixed by the AICTE.

**Duration of the Programme :** 2 Years

**Medium of instructions :** English

**3. Objective of the programme:**

- To prepare students to excel in the computing profession by providing solid technical foundations in the field of computer applications.
- To provide students various computing skills like the analysis, design and development of innovative software products to meet the industry needs.
- To motivate the students to pursue lifelong learning and to take up industrial research in computer application and other streams.

**4. Outcome of the Programme**

- To apply the knowledge of mathematics and computing fundamentals to various real life applications for any given requirement.
- To identify, critically analyze, formulate and develop computer applications.
- To select modern computing tools and techniques and use them with dexterity.
- To design a computing system to meet desired needs within realistic constraints such as safety, security and applicability.
- To devise and conduct experiments, interpret data and provide well informed conclusions

- To understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development.
- To function effectively both as a team leader and team member on multi-disciplinary projects to demonstrate computing and management skills with positive attitude.
- To communicate effectively and present technical information in oral and written reports.
- To appreciate the importance of goal setting and to recognize the need for life-long learning.
- To apply the inherent skills with absolute focus to function as a successful entrepreneur.

**5. Core subject papers :** The following are the various categories of the courses suggested for M.C.A Computer Application programme.

- Core Subjects (CS) – 14
- Elective Subjects (ES) – 3 • Practical subjects - 6
- Project - 1
- EES - Enhanced Employability Subject
- CSNME-Non Major Elective subject

**6. Subject Elective Papers :** The University shall provide all information related to the Elective Subject in M.C.A. to all the students so as to enable them to choose their Elective Subjects in each semester. The list of elective papers in each semester is displayed under the Programme structure.

**7. Unitization :** Each subject contains five units which are interrelated each other. Not only core subjects, but elective and non-major elective also contain the same.

**8. Pattern of Semester Exam :** See Annexure - PCA2

**9. Scheme for Internal Assessment :** See Annexure - PCA2

**10. External Exam :** See Annexure - PCA2

- There shall be external examinations at the end of each semester, odd semesters in the month of October / November and even semesters in April / May.
- A candidate, who has not passed the examination, may be permitted to appear in such failed subjects in the subsequent examinations to be held in October / November or April / May. A candidate should get registered for the first semester examination. If registration is not possible, owing to shortage of attendance beyond condonation limit / regulation prescribed OR belated joining OR on medical grounds, the candidates are permitted to move to the next semester. Such candidates shall re-do the missed semester after the completion of the programme.
- Students must have earned 75% of attendance in each course for appearing for the examination. Students who have earned 74% to 70% of attendance have to apply for condonation in the prescribed form with the prescribed fee. Students who have earned 69%

to 60% of attendance have to apply for condonation in the prescribed form with the prescribed fee along with the Medical Certificate.

- Students who have below 60% of attendance are not eligible to appear for the examination. They shall re-do the semester(s) after the completion of the programme.

The results of all the examinations will be published through the controller of examination where the students underwent the course as well as through University Website. In the case of private candidates, the results will be published through the Controller of Examination in which they took the examinations as well as University Website.

**11. Question Paper Pattern :** See Annexure - PCA2

**12. Unitization :** Each subject contains five units which are interrelated each other. Not only core subjects, but elective and non-major elective also contain the same.

**Pattern of Semester Exam :** See Annexure - PCA2

**10. Scheme for Internal Assessment :** See Annexure - PCA2

**11. External Exam :** See Annexure - PCA2

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- Students who have below 60% of attendance are not eligible to appear for the examination. They shall re-do the semester(s) after the completion of the programme.

The results of all the examinations will be published through the controller of examination where the students underwent the course as well as through University Website. In the case of private candidates, the results will be published through the Controller of examination in which they took the examinations as well as University Website.

**12. Question Paper Pattern :** See Annexure - PCA2

**13. Scheme of Evaluation :** The performance of a student in each course is evaluated in terms of percentage of marks with a provision of conversion to grade points. Evaluation of each course shall be done by a continuous internal assessment by the concerned Course Teacher as well as by an end semester examination and both will be consolidated at the end of the course.

A mark statement with CCPA

=

*Marks X Credits*  
*Credits*

Where the summations cover all the papers appeared up to the current semester.

**14. Passing Minimum :** A candidate passes the M.C.A., by scoring a minimum of 50% (internal + external) in each paper of the course. No minimum marks for internal assessment. External minimum for external assessment is 45% i.e., 34 out of 75.

**14.1 Classification:**

| S. No | Range of CCPA           | Class |
|-------|-------------------------|-------|
| 1     | 50 & above but below 60 | II    |
| 2     | 60 & Above              | I     |

**15. Model Questions :** One Model question paper is displayed at the end of the regulation.

**16. Teaching Methodology :** Each subject is designed with lectures/ tutorials/ seminar/ Peer-Team-Teaching / I C T presentation/ assignments etc., to meet the effective teaching and the learning requirements. 10 % of the course content must be taught through peer team teaching methodology.

**17. Text Books :** List of all the text books is quoted at the end of the syllabus of each subject.

**18. Reference Books :** The list of all the reference books is followed by the list of text books. This list contains atleast two books for each subject.

**19. Re-totaling and Revaluation Provision :** Candidates may apply for re totaling and revaluation within ten days from the date of the result published in the university website along with the required forms and fees.

**20. Transitory Provision :** The candidates of previous scheme may be permitted to write exams in their own schemes up to the examinations of April 2023 as a transitory provision.

**21. Subjects and Paper related websites :** All the subject details along with syllabus may be downloaded from the university website **[www.mkuniversity.org](http://www.mkuniversity.org)**.

## Programme Specific Qualification Attributes

### PSQA-GA Mapping

|                                    | GA1 | GA2 | GA3 | GA4 | GA5 | GA6 | GA7 | GA8 | GA9 | GA10 | GA11 | GA12 |
|------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| K1(Knowledge)                      |     |     |     |     |     |     |     |     |     |      |      |      |
| K2 (Understanding)                 |     |     |     |     |     |     |     |     |     |      |      |      |
| K3 (Application level)             |     |     |     |     |     |     |     |     |     |      |      |      |
| K4 (Analytical level)              |     |     |     |     |     |     |     |     |     |      |      |      |
| K5 (Evaluation capability level)   |     |     |     |     |     |     |     |     |     |      |      |      |
| K6 (Scientific or Synthesis level) |     |     |     |     |     |     |     |     |     |      |      |      |

### Vision

Achieving excellence in Information Technology Enabled Services through Teaching, Research, Extension and Consultancy.

### Mission

To offer accredited post graduate and research programmes with the state-of-art technology throughout the Nation

To maintain high academic standards and teaching quality

To be a centre of excellence for research and innovation in frontier areas of Computer Science and technology relevant to the country.

### Programme Objectives and Outcomes

Programme Educational Objectives

**PEO1** Sound background in fundamental core concepts and Computational principles, which are applied for complex problems Solving

**PEO2** Developing the professional skills and entrepreneur skills with Team work, leadership and communication qualities

**PEO3** Practicing lifelong learning for successful professional career with Ethical values

### Programme Outcomes (POs) for Master of Computer Applications

**P.O.1** Train the students with Deep Core subject knowledge (including the fundamental concepts, computational models, advanced core techniques, appropriate Domain expertise). Apply the knowledge of deep core concepts to conceptualize the computational models. Accredited or validated against national or international standards.

- P.O.2** Skilled with strategic thinking, problem solving, making better use of intuition, learning to evaluate better, and recognizing the essence of things. Analyze the complex problems and to evaluate and assess information in a practical and technical way and ends up with the specialized computational models to provide valid decisions.
- P.O.3** Investigating the real world problems to design and develop the computational framework to cope with real world expectations; to fit that model to the complex real-time data and to apply appropriate research methods to synthesis the information to make appropriate decisions.
- P.O.4** Trained to apply effective management skills to produce specific project outcomes
- P.O.5** Capable to learn and apply recent domain specific knowledge in the computer science and applications industry
- P.O.6** Skilled to work effectively as a member and also as a leader in multi- disciplinary teams.
- P.O.7** Trained to communicate the technical aspects with computing professionals and with society at large. Such ability includes listening reading, speaking and writing, and the ability to comprehend and effective technical report writing and document preparation.
- P.O.8** Trained to think and act professionally to adapt themselves in their work places and society to show case their talents and skills smartly for their self upliftment. Aware about the cyber regulations and professional ethics, responsibilities and norms of professional computing practice.
- P.O.9** Trained to update themselves periodically with the current/modern technologies and enrich their knowledge through various online MOOC Courses to cope with the current industrial requirements.
- P.O.10** To inculcate the passion for continuum learning for a successful Professional career
- P.O.11** Adapt at operating in other cultures, comfortable with different Nationalities and social contexts, able to determine and contribute to desirable social outcomes. Avoiding unethical behavior such as Fabrication, falsification of Data, committing plagiarism
- P.O.12** Identify the timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and the society at large.

### PEO-PO Mapping

|       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| PEO 1 |     |     |     |     |     |     |     |     |     |      |      |      |
| PEO 2 |     |     |     |     |     |     |     |     |     |      |      |      |
| PEO 3 |     |     |     |     |     |     |     |     |     |      |      |      |

### PO-GA Mapping

|      | GA1 | GA2 | GA3 | GA4 | GA5 | GA6 | GA7 | GA8 | GA9 | GA10 | GA11 | GA12 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| PO1  |     |     |     |     |     |     |     |     |     |      |      |      |
| PO2  |     |     |     |     |     |     |     |     |     |      |      |      |
| PO3  |     |     |     |     |     |     |     |     |     |      |      |      |
| PO4  |     |     |     |     |     |     |     |     |     |      |      |      |
| PO5  |     |     |     |     |     |     |     |     |     |      |      |      |
| PO6  |     |     |     |     |     |     |     |     |     |      |      |      |
| PO7  |     |     |     |     |     |     |     |     |     |      |      |      |
| PO8  |     |     |     |     |     |     |     |     |     |      |      |      |
| PO9  |     |     |     |     |     |     |     |     |     |      |      |      |
| PO10 |     |     |     |     |     |     |     |     |     |      |      |      |
| PO11 |     |     |     |     |     |     |     |     |     |      |      |      |
| PO12 |     |     |     |     |     |     |     |     |     |      |      |      |

### Programme Specific Outcomes

**P.S.O.1.** To develop the abilities to acquire deep knowledge of fundamental and core theoretical and programming concepts for holistic development

**P.S.O.2.** Design, develop and test the software systems for real-time socio- economic problems

**P.S.O.3.** Analyze and recommend appropriate IT Solutions

### **Duration of the Programme and Medium**

The programme shall be of two years duration spread over four semesters under choice based credit system. The Maximum duration to complete the course shall be three academic years after normal completion of the programme. The medium of instruction/study is English.

| <b>TANSCH REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Programme</b>                                                                                     | <b>M.C.A.,</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Programme Code</b>                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Duration</b>                                                                                      | <b>PG - Two Years</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Programme Outcomes (Pos)</b>                                                                      | <p><b>PO1: Problem Solving Skill</b><br/>Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.</p> <p><b>PO2: Decision Making Skill</b><br/>Foster analytical and critical thinking abilities for data-based decision-making.</p> <p><b>PO3: Ethical Value</b><br/>Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.</p> <p><b>PO4: Communication Skill</b><br/>Ability to develop communication, managerial and interpersonal skills.</p> <p><b>PO5: Individual and Team Leadership Skill</b><br/>Capability to lead themselves and the team to achieve organizational goals.</p> <p><b>PO6: Employability Skill</b><br/>Inculcate contemporary business practices to enhance employability skills in the competitive environment.</p> <p><b>PO7: Entrepreneurial Skill</b><br/>Equip with skills and competencies to become an entrepreneur.</p> <p><b>PO8: Contribution to Society</b><br/>Succeed in career endeavors and contribute significantly to society.</p> <p><b>PO 9 Multicultural competence</b><br/>Possess knowledge of the values and beliefs of multiple cultures and a global perspective.</p> |

|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                  | <p><b>PO 10: Moral and ethical awareness/reasoning</b><br/>Ability to embrace moral/ethical values in conducting one's life.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p><b>Programme Specific Outcomes (PSOs)</b></p> | <p><b>PSO1 – Placement</b><br/>To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.</p> <p><b>PSO 2 - Entrepreneur</b><br/>To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.</p> <p><b>PSO3 – Research and Development</b><br/>Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.</p> <p><b>PSO4 – Contribution to Business World</b><br/>To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p><b>PSO 5 – Contribution to the Society</b><br/>To contribute to the development of the society by collaborating with stakeholders for mutual benefit.</p> |

### Template for P.G., Programmes

| Semester-I                         | Credit    | Hours     | Semester-II                           | Credit    | Hours     | Semester-III                        | Credit    | Hours     | Semester-IV                                                                    | Credit    | Hours     |
|------------------------------------|-----------|-----------|---------------------------------------|-----------|-----------|-------------------------------------|-----------|-----------|--------------------------------------------------------------------------------|-----------|-----------|
| 1.1. Core-I                        | 6         | 6         | 2.1. Core-IV                          | 5         | 6         | 3.1. Core-VII                       | 5         | 6         | 4.1. Core-XI                                                                   | 5         | 6         |
| 1.2 Core-II                        | 6         | 6         | 2.2 Core-V                            | 5         | 6         | 3.2 Core-VIII                       | 5         | 6         | 4.2 Core-XII                                                                   | 5         | 6         |
| 1.3 Core – III                     | 4         | 6         | 2.3 Core – VI                         | 4         | 6         | 3.3 Core – IX                       | 3         | 5         | 4.3 Project with viva voce                                                     | 7         | 10        |
| 1.4 Discipline Centric Elective -I | 3         | 6         | 2.4 Discipline Centric Elective – III | 3         | 5         | 3.4 Core – X                        | 4         | 6         | 4.4 Elective - VI (Industry / Entrepreneurship)<br>20% Theory<br>80% Practical | 3         | 5         |
| 1.5 Generic Elective-II:           | 3         | 6         | 2.5 Generic Elective -IV:             | 3         | 5         | 3.5 Discipline Centric Elective - V | 3         | 5         | 4.5 Skill Enhancement course / Professional Competency Skill                   | 2         | 3         |
|                                    |           |           | 2.6 NME I                             | 2         | 2         | 3.6 NME II                          | 2         | 2         | 4.6 Extension Activity                                                         | 1         |           |
|                                    |           |           |                                       |           |           | 3.7 Internship/ Industrial Activity | 2         | -         |                                                                                |           |           |
|                                    | <b>22</b> | <b>30</b> |                                       | <b>22</b> | <b>30</b> |                                     | <b>24</b> | <b>30</b> |                                                                                | <b>23</b> | <b>30</b> |
| <b>Total Credit Points -91</b>     |           |           |                                       |           |           |                                     |           |           |                                                                                |           |           |

**Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credits and Hours Distribution System for all Post – Graduate Courses including Lab Hours**

**First Year – Semester – I**

| <b>Part</b> | <b>List of Courses</b> | <b>Credits</b> | <b>No. of Hours</b> |
|-------------|------------------------|----------------|---------------------|
|             | Core – I               | 6              | 6                   |
|             | Core – II              | 6              | 6                   |
|             | Core – III             | 4              | 6                   |
|             | Elective – I           | 3              | 6                   |
|             | Elective – II          | 3              | 6                   |
|             |                        | <b>22</b>      | <b>30</b>           |

**Semester-II**

| <b>Part</b> | <b>List of Courses</b>             | <b>Credits</b> | <b>No. of Hours</b> |
|-------------|------------------------------------|----------------|---------------------|
|             | Core – IV                          | 5              | 6                   |
|             | Core – V                           | 5              | 6                   |
|             | Core – VI                          | 4              | 6                   |
|             | Elective – III                     | 3              | 5                   |
|             | Elective – IV                      | 3              | 5                   |
|             | Skill Enhancement Course [SEC] - I | 2              | 2                   |
|             |                                    | <b>22</b>      | <b>30</b>           |

**Second Year – Semester – III**

| <b>Part</b> | <b>List of Courses</b>                     | <b>Credits</b> | <b>No. of Hours</b> |
|-------------|--------------------------------------------|----------------|---------------------|
|             | Core – VII                                 | 5              | 6                   |
|             | Core – VIII                                | 5              | 6                   |
|             | Core – IX                                  | 3              | 5                   |
|             | Core (Industry Module) – X                 | 4              | 6                   |
|             | Elective – V                               | 3              | 5                   |
|             | Skill Enhancement Course - II              | 2              | 2                   |
|             | Internship / Industrial Activity [Credits] | 2              | -                   |
|             |                                            | <b>24</b>      | <b>30</b>           |

**Semester-IV**

| <b>Part</b> | <b>List of Courses</b>                                         | <b>Credits</b> | <b>No. of Hours</b> |
|-------------|----------------------------------------------------------------|----------------|---------------------|
|             | Core – XI                                                      | 5              | 6                   |
|             | Core – XII                                                     | 5              | 6                   |
|             | Project with VIVA VOCE                                         | 7              | 10                  |
|             | Elective – VI (Industry Entrepreneurship)                      | 3              | 5                   |
|             | Skill Enhancement Course – III / Professional Competency Skill | 2              | 3                   |
|             | Extension Activity                                             | 1              |                     |
|             |                                                                | <b>23</b>      | <b>30</b>           |

**Total 91 Credits for PG Courses**

| <b>METHODS OF EVALUATION</b> |                                                                                                                                                                                                                                                                                                                                                                               |                  |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| <b>Internal Evaluation</b>   | Continuous Internal Assessment Test                                                                                                                                                                                                                                                                                                                                           | <b>25 Marks</b>  |
|                              | Assignments / Snap Test / Quiz                                                                                                                                                                                                                                                                                                                                                |                  |
|                              | Seminars                                                                                                                                                                                                                                                                                                                                                                      |                  |
|                              | Attendance and Class Participation                                                                                                                                                                                                                                                                                                                                            |                  |
| <b>External Evaluation</b>   | End Semester Examination                                                                                                                                                                                                                                                                                                                                                      | <b>75 Marks</b>  |
| <b>Total</b>                 |                                                                                                                                                                                                                                                                                                                                                                               | <b>100 Marks</b> |
| <b>METHODS OF ASSESSMENT</b> |                                                                                                                                                                                                                                                                                                                                                                               |                  |
| <b>Remembering (K1)</b>      | <ul style="list-style-type: none"> <li>The lowest level of questions require student store call information from the course content</li> <li>Knowledge questions usually require students to identify information in the text book.</li> </ul>                                                                                                                                |                  |
| <b>Understanding (K2)</b>    | <ul style="list-style-type: none"> <li>Understanding off acts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words.</li> <li>The questions go beyond simple recall and require students to combined at a together</li> </ul>                                                                                      |                  |
| <b>Application (K3)</b>      | <ul style="list-style-type: none"> <li>Students have to solve problems by using/applying a concept learned in the classroom.</li> <li>Students must use their knowledge to determine a exact response.</li> </ul>                                                                                                                                                             |                  |
| <b>Analyze (K4)</b>          | <ul style="list-style-type: none"> <li>Analyzing the question is one that asks the students to break down something in to its component parts.</li> <li>Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations.</li> </ul>                                                                                                |                  |
| <b>Evaluate (K5)</b>         | <ul style="list-style-type: none"> <li>Evaluation requires an individual to make judgment on something.</li> <li>Questions to be asked to judge the value of an idea, a character, a work of art, or a solution to a problem.</li> <li>Students are engaged indecision-making and problem–solving.</li> <li>Evaluation questions do not have single right answers.</li> </ul> |                  |
| <b>Create (K6)</b>           | <ul style="list-style-type: none"> <li>The questions of this category challenge students to get engaged in creative and original thinking.</li> <li>Developing original ideas and problem solving skills</li> </ul>                                                                                                                                                           |                  |

**PROGRAMME OUTCOMES (PO) - PROGRAMME SPECIFIC OUTCOMES (PSO) MAPPING**

| <b>PROGRAMME SPECIFIC OUTCOMES (PSO)</b> |            |            |            |            |            |
|------------------------------------------|------------|------------|------------|------------|------------|
|                                          | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> |
| <b>PSO1</b>                              | 3          | 3          | 3          | 3          | 3          |
| <b>PSO2</b>                              | 3          | 3          | 3          | 3          | 3          |
| <b>PSO3</b>                              | 3          | 3          | 3          | 3          | 3          |
| <b>PSO4</b>                              | 3          | 3          | 3          | 3          | 3          |
| <b>PSO5</b>                              | 3          | 3          | 3          | 3          | 3          |

**Level of Correlation between PO's and PSO's**

*(Suggested by UGC as per Six Sigma Tool – Cause and Effect Matrix)*

Assign the value

**1 – Low    2 – Medium    3 – High    0 – No Correlation**

| Course                                                                                                 | Number<br>of<br>Credits | Hours<br>Per<br>Week | Examination<br>Duration<br>(hrs) | Marks   |     |       |
|--------------------------------------------------------------------------------------------------------|-------------------------|----------------------|----------------------------------|---------|-----|-------|
|                                                                                                        |                         |                      |                                  | I.<br>A | ESE | Total |
| Semester - I                                                                                           |                         |                      |                                  |         |     |       |
| Core – I Theory<br>Discrete Mathematics                                                                | 6                       | 6                    | 3                                | 25      | 75  | 100   |
| Core – II Theory<br>Linux and shell programming                                                        | 6                       | 6                    | 3                                | 25      | 75  | 100   |
| Core – III Theory<br>Python Programming                                                                | 4                       | 6                    | 3                                | 25      | 75  | 100   |
| Elective – I (GEC/DSEC1)<br>Data Engineering and<br>Management Lab/ Architecture<br>and Frameworks Lab | 3                       | 6                    | 3                                | 40      | 60  | 100   |
| Elective – II (GEC/DSEC2)<br>Software Development<br>Technologies Lab/<br>Soft Computing Lab           | 3                       | 6                    | 3                                | 40      | 60  | 100   |
|                                                                                                        | 22                      | 30                   |                                  |         |     |       |

| Course                                                                                                  | Number<br>of<br>Credits | Hours<br>Per<br>Week | Examination<br>Duration<br>(hrs) | Marks   |     |       |
|---------------------------------------------------------------------------------------------------------|-------------------------|----------------------|----------------------------------|---------|-----|-------|
|                                                                                                         |                         |                      |                                  | I.<br>A | ESE | Total |
| Semester - II                                                                                           |                         |                      |                                  |         |     |       |
| Core - IV Theory<br>Data Structures and Algorithms                                                      | 5                       | 6                    | 3                                | 25      | 75  | 100   |
| Core – V Theory<br>Big Data Analytics                                                                   | 5                       | 6                    | 3                                | 25      | 75  | 100   |
| Core – VI Lab<br>Data Structures and Algorithms<br>Lab                                                  | 4                       | 6                    | 3                                | 40      | 60  | 100   |
| Elective - III (GEC/DSEC3)<br>Internet of Things Lab/ Computer<br>Vision Lab                            | 3                       | 5                    | 3                                | 40      | 60  | 100   |
| Elective – IV (GEC/DSEC4 )<br>Cryptography and Network<br>Security Lab/<br>Block chain Technologies Lab | 3                       | 5                    | -                                | 40      | 60  | 100   |
| NME Fundamentals of Human<br>Rights                                                                     | 2                       | 2                    | 3                                | 25      | 75  | 100   |
|                                                                                                         | 22                      | 30                   |                                  |         |     | 1000  |

| Course                                                            | Number<br>of<br>Credits | Hours<br>Per<br>Week | Examination<br>Duration<br>(hrs) | Marks   |     |       |
|-------------------------------------------------------------------|-------------------------|----------------------|----------------------------------|---------|-----|-------|
|                                                                   |                         |                      |                                  | I.<br>A | ESE | Total |
| Semester - III                                                    |                         |                      |                                  |         |     |       |
| Core VII Theory<br>Advanced Java Programming                      | 5                       | 6                    | 3                                | 25      | 75  | 100   |
| Core VIII Theory<br>Web Technology                                | 5                       | 6                    | 3                                | 25      | 75  | 100   |
| Core IX Theory<br>Advanced Machine Learning<br>(AML)              | 3                       | 5                    | 3                                | 25      | 75  | 100   |
| Core X Lab<br>Advanced Java Programming lab                       | 4                       | 6                    | 3                                | 40      | 60  | 100   |
| Elective –V Lab Web Technology<br>Lab                             | 3                       | 5                    | 3                                | 40      | 60  | 100   |
| NME Lab<br>Integrated Technology (AML) Lab<br>(Self-study course) | 2                       | 2                    | 3                                | 40      | 60  | 100   |
| Internship Industrial Activity                                    | 2                       | -                    | -                                | -       | 100 | 100   |
|                                                                   | 24                      | 30                   |                                  |         |     | 1100  |

| Course                                                                                 | Number<br>of<br>Credits | Hours<br>Per<br>Week | Examination<br>Duration<br>(hrs) | Marks   |     |       |
|----------------------------------------------------------------------------------------|-------------------------|----------------------|----------------------------------|---------|-----|-------|
|                                                                                        |                         |                      |                                  | I.<br>A | ESE | Total |
| Semester - IV                                                                          |                         |                      |                                  |         |     |       |
| Core - XI<br>Industry Dynamics Technology-<br>Data Visualisation (Mobile<br>Computing) | 5                       | 6                    | -                                | 25      | 75  | 100   |
| Core – XII<br>SOFTWARE PROJECT<br>MANAGEMENT                                           | 5                       | 6                    | -                                | 25      | 75  | 100   |
| Project with Viva voce                                                                 | 7                       | 10                   |                                  |         |     |       |
| Elective – VI<br>Social Networks Lab/<br>High Performance Computing<br>Lab             | 3                       | 5                    |                                  | 40      | 60  | 100   |
| Skill Enhancement Professional<br>Competency Skill                                     | 2                       | 3                    |                                  |         |     |       |
| Extension Activity                                                                     | 1                       |                      |                                  |         |     |       |
| <b>Total</b>                                                                           | <b>23</b>               | <b>30</b>            |                                  |         |     |       |
| <b>Total Credits</b>                                                                   | <b>91</b>               |                      |                                  |         |     |       |

## Semester I

### Discrete Mathematics

#### Course Objective

- To know the concepts of relations and functions
- To distinguish among different normal forms and quantifiers
- To solve recurrence relations and permutations & combinations
- To know and solve matrices , rank of matrix & characteristic equations
- To study the graphs and its types

#### Unit-I

**Relations-** Binary relations-Operations on relations- properties of binary relations in a set – Equivalence relations— Representation of a relation by a matrix -Representation of a relation by a digraph – **Functions**-Definition and examples-Classification of functions-Composition of functions-Inverse function.

#### Unit-II

**Mathematical Logic**-Logical connectives-**Well formed formulas** – Truth table of well formed formula –Algebra of proposition –Quine’s method- **Normal forms of well formed formulas**-Disjunctive normal form-Principal Disjunctive normal form-Conjunctive normal form-Principal conjunctive normal form-**Rules of Inference for propositional calculus** – **Quantifiers**- Universal Quantifiers- Existential Quantifiers.

#### Unit-III

**Recurrence Relations-** Formulation -solving recurrence Relation by Iteration- solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of Order Two- Solving Linear Non homogeneous Recurrence Relations. **Permutations**-Cyclic permutation- Permutations with repetitions- permutations of sets with indistinguishable objects- **Combinations**- Combinations with repetition.

#### Unit-IV

**Matrices-** special types of matrices-Determinants-Inverse of a square matrix-Cramer’s rule for solving linear equations-Elementary operations-Rank of a matrix-solving a system of linear equations-characteristic roots and characteristic vectors-Cayley-Hamilton Theorem-problems.

#### Unit-V

**Graphs** -Connected Graphs -Euler Graphs- Euler line-Hamiltonian circuits and paths –planar graphs – Complete graph-Bipartite graph-Hyper cube graph-Matrix representation of graphs

**Text book**

1. N.Chandrasekaran and M.Umaparvathi, Discrete mathematics, PHI Learning Private Limited, New Delhi, 2010.

**Reference Book**

1. Kimmo Eriksson & Hillevi Gavel, Discrete Mathematics & Discrete Models, Studentlitteratur AB, 2015.
2. Kenneth H. Rosen Discrete Mathematics and applications, Mc Graw Hill, 2012

**Course Outcomes**

On the successful completion of the course, students will be able

|      |                                                                                      |       |    |
|------|--------------------------------------------------------------------------------------|-------|----|
| CO1: | To understand the concepts of relations and functions distinguish among normal forms | K2    | IO |
| CO2: | To analyze and evaluate the recurrence relations                                     | K4,K5 | HO |
| CO3: | To distinguish among various normal forms and predicate calculus                     | K5    | HO |
| CO4: | To solve and know various types of matrices                                          | K1    | LO |
| CO5: | To evaluate and solve various types of graphs                                        | K5    | HO |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

**Linux and Shell Programming****Course Objective**

- To teach principles of operating system including File handling utilities, Basic Linux commands, Scripts and filters.
- To familiarize fundamentals of shell (bash), shell programming, pipes, Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts.
- To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's).
- To facilitate students in understanding Inter process communication, semaphore and shared memory.
- To explore real-time problem solution skills in Shell programming.

**Unit-I**

**Basic bash Shell Commands:** Interacting with the shell-Traversing the file system-Listing files and directories-Managing files and directories-Viewing file contents. **Basic Script Building:** Using multiple commands-Creating a script file-Displaying messages-Using variables-Redirecting input and

output-Pipes-Performing math-Exiting the script. **Using Structured Commands:** Working with the if-then statement-Nesting ifs-Understanding the test command-Testing compound conditions-Using double brackets and parentheses-Looking at case.

(Book-1, Chapters: 3, 11, and 12)

## Unit-II

**More Structured Commands:** Looping with for statement-Iterating with the until statement-Using the while statement-Combining loops-Redirecting loop output. **Handling User Input:** Passing parameters-Tracking parameters-Being shifty-Working with options-Standardizing options-Getting user input. **Script Control:** Handling signals-Running scripts in the background-Forbidding hang-ups -Controlling a Job-Modifying script priority-Automating script execution.

(Book-1, Chapters: 13, 14, and 16)

## Unit-III

**Creating Functions:** Basic script functions-Returning a value-Using variables in functions-Array and variable functions-Function recursion-Creating a library-Using functions on the command line. **Writing Scripts for Graphical Desktops:** Creating text menus-Building text window widgets-Adding X Window graphics. **Introducing sed and gawk:** Learning about the sed Editor-Getting introduced to the gawk Editor-Exploring sed Editor basics.

(Book-1, Chapters: 17, 18, and 19)

## Unit-IV

**Regular Expressions:** Defining regular expressions-Looking at the basics-Extending our patterns-Creating expressions. **Advanced sed:** Using multiline commands-Understanding the hold space-Negating a command-Changing the flow-Replacing via a pattern-Using sed in scripts-Creating sed utilities. **Advanced gawk:** Reexamining gawk-Using variables in gawk-Using structured commands-Formatting the printing-Working with functions.

(Book-1, Chapters: 20, 21, and 22)

## Unit-V

**Working with Alternative Shells:** Understanding the dash shell-Programming in the dash shell-Introducing the zsh shell-Writing scripts for zsh.**Writing Simple Script Utilities:** Automating backups-Managing user accounts-Watching disk space. **Producing Scripts for Database, Web, and E-Mail:** Writing database shell scripts-Using the Internet from your scripts-Emailing reports from scripts. **Using Python as a Bash Scripting Alternative:** Technical requirements-Python Language-Hello World the Python way-Pythonic arguments-Supplying arguments-Counting arguments-Significant whitespace-Reading user input-Using Python to write to files-String manipulation.

(Book-1, Chapters: 23, 24, 25, and Book-2, Chapter: 14)

**Text book:**

1. Richard Blum, Christine Bresnahan, “Linux Command Line and Shell Scripting BIBLE”, Wiley Publishing, 3<sup>rd</sup> Edition, 2015. **Chapters:** 3, 11 to 14, 16 to 25.
2. Mokhtar Ebrahim, Andrew Mallett, “Mastering Linux Shell Scripting”, Packt Publishing, 2<sup>nd</sup> Edition, 2018. **Chapter:** 14.

### Reference Books:

1. CliffFlynt,namhskaLhtaraS,rahsuTunatnahS, “ koobkooC gnitpirCS llehS xuniL”, tkcaP gnihsilbuP, 3<sup>rd</sup> Edition, 2017.
2. Stephen G.Kochan, Patrick Wood, “Shell Programming in Unix, Linux, and OS X”, Addison Wesley Professional, 4<sup>th</sup> Edition, 2016.
3. Robert Love, “Linux System Programming”, O'Reilly Media, Inc, 2013
4. W.R. Stevens, “Advanced Programming in the UNIX environment”, 2nd Edition, Pearson Education, 2013
5. Graham Glass, King Ables, “ UNIX for Programmers and Users”, 3rd Edition, Pearson Education, 2003

### Course Outcomes

On the successful completion of the course, students will be able

|      |                                                                                                                                          |       |
|------|------------------------------------------------------------------------------------------------------------------------------------------|-------|
| CO1: | To understand, apply and analyze the concepts and methodology of Linux shell programming                                                 | K1-K6 |
| CO2: | To comprehend, impart and apply fundamentals of control structure and script controls                                                    | K1-K6 |
| CO3: | To understand, analyses and evaluate the functions, graphical desktop interface and editors                                              | K1-K6 |
| CO4: | To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk                                    | K1-K6 |
| CO5: | To comprehend, use and illustrate the advance concepts such as alternate shell script, data connectivity and bash scripting using python | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### Mapping with Programme Outcomes

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | S   | -   | S   | L   | -   | M   | M   | M    | M    | S    |
| CO2 | S   | S   | M   | -   | S   | L   | -   | M   | M   | M    | M    | S    |
| CO3 | S   | S   | M   | -   | S   | L   | -   | M   | M   | S    | S    | S    |

|     |   |   |   |   |   |   |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|
| CO4 | S | S | M | - | S | L | - | M | M | M | M | S |
| CO5 | S | S | M | - | S | L | - | M | M | M | M | S |

**S- Strong; M-Medium; L-Low**

## **Python Programming**

### **Course Objectives:**

- To acquire programming skills in core Python
- To learn Strings and function
- To develop object oriented skills in Python
- To comprehend various Python Packages
- To develop web applications using Django

### **Unit I**

Introduction : Fundamental ideas of Computer Science - Strings, Assignment, and Comments - Numeric Data types and Character sets – Expressions – Loops and Selection Statements: Definite iteration: the for Loop - selection: if and if-else statements - Conditional iteration: the while Loop.

### **Unit II**

Strings and Text Files: Accessing Characters and substrings in strings - Data encryption-Strings and Number systems- String methods – Text - Lists and Dictionaries: Lists – Dictionaries – Design with Functions: A Quick review - Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program's namespace - Higher-Order Functions.

### **Unit III**

Design with Classes: Getting inside Objects and Classes – Data-Modeling Examples – Building a New Data Structure – The Two – Dimensional Grid - Structuring Classes with Inheritance and Polymorphism - GraphicalUser Interfaces - The Behavior of terminal-Based programs and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events.

### **Unit IV**

Working with Python Packages: NumPy Library-Ndarray – Basic Operations – Indexing, Slicing and Iteration – Array manipulation - Pandas –The Series – The DataFrame - The Index Objects – Data Vizualization with Matplotlib – The Matplotlib Architecture – pyplot – The Plotting Window – Adding Elements to the Chart – Line Charts – Bar Charts – Pie charts.

### **Unit V**

Django: Installing Django – Building an Application – Project Creation – Designing the Data Schema - Creating an administration site for models - Working with QuerySets and Managers – Retrieving Objects – Building List and Detail Views.

### **Text Book:**

1. K.A. Lambert, “ Fundamentals of Python: first programs”, Second Edition, Cengage Learning, 2018 (**Unit - I, II and III**)
2. Fabio Nelli, “Python Data Analytics: With Pandas, NumPy, and Matplotlib”, Second Edition, Kindle Edition, 2018 (**Unit - IV**)
3. Antonio Mele, “Django 3 By Example”, Third Edition, 2020 (**Unit - V**)

## Course Outcomes

**On the successful completion of the course, students will be able to**

- CO1** Comprehend the programming skills in python and develop applications using conditional branches and loop
- CO2** Create python applications with strings and functions
- CO3** Understand and implement the Object Oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism
- CO4** Evaluate the use of Python packages to perform numerical computations and data vizualization
- CO5** Design interactive web applications using Django
- K1- K6**

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

## Mapping with Programme Outcomes

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M   | S   | M   | S   | S   | S   | S   | M    | S    | S    |
| CO2 | S   | S   | S   | M   | S   | S   | S   | S   | S   | S    | M    | S    |
| CO3 | S   | M   | S   | S   | M   | S   | M   | S   | S   | M    | S    | S    |
| CO4 | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    | M    | S    |
| CO5 | S   | S   | S   | S   | S   | S   | S   | S   | S   | M    | M    | S    |

**S- Strong; M-Medium; L-Low**

## Data Engineering and Management Lab

### Course Objectives:

- To acquire basic scripting knowledge in MongoDB
- To learn CRUD Operation on MongoDB database
- To comprehend MongoDB using DbVisualizer
- To be familiar with Zoho CRM features
- To customize your application using Zoho CRM

1. Write a script to create a MongoDB database and perform insert operation
2. Write a MongoDB script to perform query operations
3. Write a MongoDB Script to perform update operations
4. Write a MongoDB Script to update documents with aggregation pipeline
5. Write a MongoDB script to delete single and multiple documents
6. Write a MongoDB script to perform string aggregation operations
7. Design a Data Model for MongoDB using DbVisualizer
8. Perform CRUD operations using DbVisualizer
9. Create a Zoho CRM account and organize your Tasks, Meetings and Deals
10. Create and maintain a project using Zoho CRM features

### Course Outcomes

On the successful completion of the course, students will be able to

| Course Outcome | Description                                                                                | Knowledge Level |
|----------------|--------------------------------------------------------------------------------------------|-----------------|
| <b>CO1</b>     | Comprehend the scripting knowledge in MongoDB and perform basic operations in shell prompt | <b>K1- K6</b>   |
| <b>CO2</b>     | Implement, Create, Read, Update and Delete Operations on MongoDB database                  |                 |
| <b>CO3</b>     | Analyze MongoDB using DbVisualizer                                                         |                 |
| <b>CO4</b>     | Assess Zoho CRM features for managing the customer relationships                           |                 |
| <b>CO5</b>     | Create a customized application in Zoho CRM                                                |                 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### Mapping with Programme Outcomes

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | S   | S   | S   | M   | S   | S   | S   | M    | S    | S    |
| CO2 | S   | S   | S   | S   | S   | S   | S   | S   | S   | S    | L    | S    |
| CO3 | S   | M   | S   | S   | M   | S   | M   | S   | S   | S    | S    | S    |

|     |   |   |   |   |   |   |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|
| CO4 | S | S | S | M | S | S | S | L | S | S | M | S |
| CO5 | S | S | S | S | M | S | S | S | S | S | S | S |

**S- Strong; M-Medium; L-Low**

### **Architecture and Frameworks - Lab**

#### **Course Objectives**

- To understand and implement the basic concepts of Software architecture and its functions.
- To acquire programming skills to develop Implement various technologies and services associated with network protocols along with the challenges of data transfer.
- Implement the importance and functioning of Routing Protocols over communication service.
- To acquire skills to connect two routers and any two switches.
- To comprehend related to SSH protocols and accessing the remote device.

Note: Use the solid servers and client specification for implementation

<https://github.com/solid/specification/>.

Implement the following using Linux / Windows environments

1. Find the WebID profile document and display the necessary attributes
2. Set and access the primary authentications with account recovery mechanisms
3. Set and access the secondary authentications with account recovery mechanisms
4. Design authorization and web access control
5. Find the content representation
6. Reading resources from HTTP REST API and WebSockets API
7. Writing resources from HTTP REST API and WebSockets API
8. Data notification using Social Web App protocol
9. Managing subscriptions and friends list using Social Web App protocol
10. Managing list of followers and following list using Social Web App protocol

#### **Course Outcomes**

On the successful completion of the course, students will be able to

|     |                                                                                        |       |
|-----|----------------------------------------------------------------------------------------|-------|
| CO1 | Comprehend the programming skills of Software architecture tools and packages          | K1-K6 |
| CO2 | Understand and implement the user profiles and authentication with recovery mechanism. | K1-K6 |

|     |                                                                                                     |       |
|-----|-----------------------------------------------------------------------------------------------------|-------|
| CO3 | Comprehend and evaluate the access control and content representation use of FTP server             | K1-K6 |
| CO4 | Understand and implement reading and writing resources for various applications                     | K1-K6 |
| CO5 | Identify and examine the notifications, friends, and follower list of social application protocols. | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5-Evaluate, K6- Create**

### **Mapping Course outcomes with Programme outcomes**

| COs  | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO9 | PO10 | PO11 | PO12 |
|------|------|------|------|------|------|------|------|------|-----|------|------|------|
| CO 1 | S    | S    | M    | L    | M    | S    | -    | -    | -   | -    | -    | -    |
| CO 2 | S    | M    | S    | S    | S    | M    | -    | -    | -   | -    | -    | -    |
| CO 3 | S    | M    | S    | M    | S    | M    | -    | -    | -   | -    | -    | -    |
| CO 4 | S    | M    | L    | S    | M    | L    | -    | -    | -   | -    | -    | -    |
| CO 5 | M    | S    | M    | L    | S    | L    | -    | -    | -   | -    | -    | -    |

**S- Strong; M-Medium; L-Low**

### **Software Development Technologies Lab**

#### **Course Objectives**

- To understand the concept of DevOps with associated technologies and methodologies.
- To be familiarized with Jenkins, which is used to build & test software Applications
- To understand Continuous integration in Devops environment.
- To understand Docker to build, ship and run containerized images
- To use Docker to deploy and manage Software applications running on Container.

#### **List of Programs**

1. Deploy Version Control System / Source Code Management, install git and create a GitHub account.
2. Perform various GIT operations on local and Remote repositories using GIT Cheat-Sheet
3. Continuous Integration: install and configure Jenkins with Maven/Ant/Gradle to setup a build Job.
4. Build the pipeline of jobs using Maven / Gradle / Ant in Jenkins, create a pipeline script to Test and deploy an application over the tomcat server.
5. Implement Jenkins Master-Slave Architecture and scale your Jenkins standalone implementation by implementing slave nodes.

6. Setup and Run Selenium Tests in Jenkins Using Maven.
7. Implement Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers.
8. Implement Dockerfile instructions, build an image for a sample web application using Dockerfile.
9. Install and Configure Pull based Software Configuration Management and provisioning tools using Puppet.
10. Implement LAMP/MEAN Stack using Puppet Manifest.

## Course Outcomes

On the successful completion of the course, students will be able to

|      |                                                                                                                  |       |
|------|------------------------------------------------------------------------------------------------------------------|-------|
| CO1: | To Understand and analyse the importance of Jenkins to Build, Deploy and Test Software Applications              | K1-K6 |
| CO2: | To synthesis and summarize the importance of Software Configuration Management in DevOps                         | K1-K6 |
| CO3: | To identify, analyze and illustrate the Containerization of OS images and deployment of applications over Docker | K1-K6 |
| CO4  | To design, analyze and develop the Pull based Software Configuration Management                                  | K1-K6 |
| CO5  | To design, analyze and develop Puppet Manifest                                                                   | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

## Mapping with Programme Outcomes

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M   | -   | M   | -   | -   | -   | S   | S    | S    | S    |
| CO2 | S   | S   | M   | -   | M   | -   | -   | -   | S   | S    | S    | S    |
| CO3 | S   | S   | M   | -   | M   | -   | -   | -   | S   | S    | S    | S    |
| CO2 | S   | S   | M   | -   | M   | -   | -   | -   | S   | S    | S    | S    |
| CO3 | S   | S   | M   | -   | M   | -   | -   | -   | S   | S    | S    | S    |

**S- Strong; M-Medium; L-Low**

## Soft Computing Lab

## COURSE OBJECTIVES:

- To implement various Supervised Neural Network-based approaches
- To apply the fuzzy-based logical operations and arithmetic operations
- To implement unsupervised neural network approaches

- To solve a problem using a simple genetic algorithm
- To implement logic gates.

### Program List

1. Implementation of Logic gates using Artificial Neural Network.
2. Implementation of Perception Algorithm.
3. Implementation of Back Propagation Algorithm.
4. Implementation of Self Organizing Maps.
5. Implementation of Radial Basis Function Network.
6. Implementation of De-Morgan's Law.
7. Implementation of McCulloch Pits Artificial Neuron model
8. Implementation of Simple genetic algorithm
9. Implementation of fuzzy based Logical operations
10. Implementation of fuzzy based arithmetic operations

### COURSE OUTCOMES:

On the successful completion of the course, students will be able to

|     |                                                           |        |    |
|-----|-----------------------------------------------------------|--------|----|
| CO1 | To apply supervised learning algorithms for real datasets | K- 1K2 | LO |
| CO2 | To implement Unsupervised Learning techniques             | K3     | IO |
| CO3 | To apply fuzzy based arithmetic and logical operations    | K3- K4 | HO |
| CO4 | To find solutions for problems using Genetic algorithm    | K4     | IO |
| CO5 | To implement DeMorgan's Law                               | K5     | HO |

### MAPPING WITH PROGRAMME OUTCOMES

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | M   | M   | S   | M   | S   | S   | S   | M   | S   | M    | S    | S    |
| CO2 | M   | S   | M   | M   | M   | M   | M   | S   | M   | S    | M    | M    |
| CO3 | M   | M   | S   | S   | S   | M   | M   | S   | S   | S    | S    | S    |
| CO4 | S   | S   | S   | M   | M   | S   | S   | M   | S   | S    | S    | M    |
| CO5 | S   | S   | S   | S   | S   | M   | M   | M   | M   | S    | M    | M    |

**S- STRONG; M-MEDIUM; L-LOW**

**Semester - II**  
**Data Structures and Algorithms**

**Course Objectives:**

- To get a clear understanding of various ADT structures.
- To understand how to implement different ADT structures with real-time scenarios.
- To analyze the various data structures with their different implementations.
- To get an idea of applying right models based on the problem domain.
- To realize, and understand how and where to implement modern data structures with Python language.

**Unit-I**

**Abstract Data Types:** Introduction-Data Abstract Data Type-Bags-Iterators. **Arrays:** Array Structure-Python List-Two Dimensional Arrays-Matrix Abstract Data Type. **Sets, Maps:** Sets-Maps- Multi-Dimensional Arrays.

**Unit-II**

**Algorithm Analysis:** Experimental Studies-Seven Functions-Asymptotic Analysis. **Recursion:** Illustrative Examples-Analyzing Recursive Algorithms-Linear Recursion- Binary Recursion-Multiple Recursion.

**Unit-III**

**Stacks, Queues, and Deques:** Stacks- Queues- Double-Ended Queues Linked. **Lists:** Singly Linked Lists-Circularly Linked Lists-Doubly Linked Lists. **Trees:** General Trees-Binary Trees-Implementing Trees-Tree Traversal Algorithms.

**Unit-IV**

**Priority Queues:** Priority Queue Abstract Data Type- Implementing a Priority Queue- Heaps-Sorting with a Priority Queue. **Maps, Hash Tables, and Skip Lists:** Maps and Dictionaries-Hash Tables-Sorted Maps-Skip Lists-Sets, Multisets, and Multimaps.

**Unit-V**

**Search Trees:** Binary Search Trees-Balanced Search Trees-AVL Trees-Splay Trees. **Sorting and Selection:** Merge sort-Quick sort-Sorting through an Algorithmic Lens- Comparing Sorting Algorithms-Selection. **Graph Algorithms:** Graphs-Data Structures for Graphs-Graph Traversals-Shortest Paths-Minimum Spanning Trees.

**Text book:**

1. Rance D. Necaise, “Data Structures and Algorithms Using Python”, John Wiley & Sons, 2011. (Unit – 1)**Chapters:** 1, 2, 3.
2. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structures and Algorithms in Python”, John Wiley & Sons, 2013. (Unit – 2, 3, 4, and 5)**Chapters:** 3 to 12, and 14.

**Reference books:**

1. Dr. Basant Agarwal; Benjamin Baka, “Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7”, Packt Publishing, 2018.
2. Magnus Lie Hetland, “Python Algorithms: Mastering Basic Algorithms in the Python Language”, Apress, 2014.

**Course Outcome:**

On the successful completion of the course, students will be able to,

|     |                                                                                                                                      |       |
|-----|--------------------------------------------------------------------------------------------------------------------------------------|-------|
| CO1 | Understand various ADT concepts                                                                                                      | K1-K6 |
| CO2 | Familiar with implementation of ADT models with Python language and understand how to develop ADT for the various real-time problems |       |
| CO3 | Apply with proper ADT models with problem understanding                                                                              |       |
| CO4 | Apply and Analyze right models based on the problem domain                                                                           |       |
| CO5 | Evaluate modern data structures with Python language                                                                                 |       |

K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create

**Mapping with Programme Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | M   | L   | L   | L   | L   | S   | S   | S   | L    | M    | M    |
| CO2 | S   | M   | S   | M   | M   | L   | L   | L   | L   | L    | M    | M    |
| CO3 | S   | S   | S   | L   | L   | L   | M   | M   | M   | M    | M    | L    |
| CO4 | S   | S   | S   | L   | L   | L   | M   | M   | M   | L    | L    | L    |
| CO5 | S   | S   | S   | L   | M   | M   | S   | S   | S   | S    | M    | L    |

**L - Low, M- Medium, S – Strong**

**Big Data Analytics****Course Objectives**

- To introduce big data tools & Information Standard formats.
- To understand the basic concepts of big data.
- To learn Hadoop, HDFS and MapReduce concepts.
- To teach the importance of NoSQL.
- To explore the big data tools such as Hive, HBase and Pig.

## UNIT I

**Big Data and Analytics:** Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data.

Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop.

Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency - Top Analytics Tools

## UNIT II

**Technology Landscape:**NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem

## UNIT III

**Mongodb and Mapreduce Programming:**MongoDB: Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language.

MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression

## UNIT IV

**Hive:** Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation - Hive User Defined Function - Serialization and Deserialization.

## UNIT V

**Pig:** Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution – Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive

### Text Book:

1. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley Publications, First Edition, 2015

### Reference Book:

1. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, “Big data for dummies”, John Wiley & Sons, Inc. (2013)
2. Tom White, “Hadoop The Definitive Guide”, O’Reilly Publications, Fourth Edition, 2015
3. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, “Hadoop For Dummies”, Wiley Publications, 2014

4. Robert D.Schneider, “Hadoop For Dummies”, John Wiley & Sons, Inc. (2012)
5. Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012 Chuck Lam, “Hadoop In Action”, Dreamtech Publications, 2010

### Course Outcomes

On the successful completion of the course, students will be able to

|      |                                                                                                                               |       |
|------|-------------------------------------------------------------------------------------------------------------------------------|-------|
| CO1: | To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools          | K1-K6 |
| CO2: | To collaborate, apply and review the computing for big data in Hadoop, and NoSQL environment.                                 | K1-K6 |
| CO3: | To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, and MongoDB | K1-K6 |
| CO4: | To understand, use and analyze the concepts of big data analytics projects using HIVE database.                               | K1-K6 |
| CO5: | To illustrate, develop and review the concepts of PIG database in Hadoop environment.                                         | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5 Evaluate, K6- Create**

### Mapping with Programme Outcomes

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | -   | -   | -   | -   | L   | -   | -   | -   | -    | -    | -    |
| CO2 | S   | -   | M   | -   | M   | L   | -   | -   | -   | -    | -    | -    |
| CO3 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |
| CO4 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |
| CO5 | S   | -   | S   | -   | S   | L   | -   | -   | -   | S    | S    | S    |

**S- Strong; M-Medium; L-Low**

### Data Structures and Algorithms Lab

#### Course Objectives:

- To understand Stack , Queue and Doubly Linked ADT structures.
- To implement different ADT structures with real-time scenarios.
- To analyze the recursion concepts.
- To apply different sorting and tree techniques.
- To implement modern data structures with Python language.

#### Implement the following problems using Python 3.4 and above

1. Recursion concepts.

- i) Linear recursion
  - ii) Binary recursion.
- 2. Stack ADT.
- 3. Queue ADT.
- 4. Doubly Linked List ADT.
- 5. Heaps using Priority Queues.
- 6. Merge sort.
- 7. Quick sort.
- 8. Binary Search Tree.
- 9. Minimum Spanning Tree.
- 10. Depth First Search Tree traversal.

### Course Outcome:

On the successful completion of the course, students will be able to,

|     |                                                             |       |
|-----|-------------------------------------------------------------|-------|
| CO1 | Strong understanding in various ADT concepts                | K1-K6 |
| CO2 | To become a familiar with implementation of ADT models      |       |
| CO3 | Apply sort and tree search algorithms                       |       |
| CO4 | Evaluate the different data structure models                |       |
| CO5 | Learn how to develop ADT for the various real-time problems |       |

K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create

### Mapping with Programme Outcomes:

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | M   | L   | L   | L   | L   | S   | S   | M   | M    | S    | S    |
| CO2 | S   | M   | S   | M   | M   | L   | S   | M   | S   | L    | M    | M    |
| CO3 | S   | S   | S   | L   | L   | L   | M   | M   | M   | M    | S    | L    |
| CO4 | S   | S   | S   | M   | M   | S   | M   | M   | S   | S    | S    | L    |
| CO5 | S   | S   | S   | S   | L   | M   | S   | M   | M   | M    | M    | L    |

**L - Low, M- Medium, S – Strong**

## **Internet of Things Lab**

### **Course Objectives:**

- To create IoT program to turn ON/OFF LED
  - To implement IoT program for object detection
  - To develop IoT programs for agricultural purpose
  - To create web server program for local hosting
  - To design IoT application for health monitoring
- 
1. To develop an IoT program to turn ON/OFF LED light (3.3V)
  2. To develop an IoT program using IR sensor (Smart Garbage Monitoring, Detecting Parking Availability, etc.)
  3. To develop an IoT program using Humidity and Temperature Monitoring (Forest fire Detection, Weather Monitoring)
  4. To develop an IoT web server program for local hosting
  5. To develop an IoT program using Soil Moisture Sensor
  6. To develop an IoT program using Ultrasonic Sensor (Distance Measurement, etc.)
  7. To develop an real-time IoT program using Relay Module (Smart Home Automation with 230V)
  8. To develop an IoT program for Fire Detection (Home, Industry, etc.)
  9. To develop an IoT program for Gas Leakage detection (Home, Industry, etc.)
  10. To develop an IoMT program using Heartbeat Sensor

### **Course Outcomes**

On the successful completion of the course, students will be able to,

|            |                                                |                |
|------------|------------------------------------------------|----------------|
| <b>CO1</b> | Implement IoT programs to turn ON/OFF LED      | <b>K1 - K6</b> |
| <b>CO2</b> | Develop IoT programs for object detection      |                |
| <b>CO3</b> | Create IoT programs for agricultural purpose   |                |
| <b>CO4</b> | Implement web server program for local hosting |                |
| <b>CO5</b> | Design IoT application for health monitoring   |                |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### **Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M   | S   | S   | S   | M   | S   | S   | S    | S    | S    |
| CO2 | S   | S   | S   | S   | S   | S   | S   | M   | S   | S    | M    | S    |
| CO3 | S   | M   | S   | S   | S   | S   | M   | S   | S   | M    | S    | S    |
| CO4 | S   | S   | S   | S   | S   | S   | S   | S   | S   | L    | M    | S    |
| CO5 | S   | S   | S   | S   | M   | S   | L   | S   | S   | M    | M    | S    |

S- Strong; M-Medium; L-Low

### Computer Vision Lab

#### **Course Objectives:**

- To get an idea of how to build a computer vision application with Python language.
- To learn the basic image handling and processing
- To get familiar with various Computer Vision fundamental algorithms and how to implement and apply.
- To get an idea of how to implement the image transforms.
- To understand various image segmentation algorithms.

Implement the following problems using Python with OpenCV

1. Image Loading, Exploring, and displaying an Image.
2. Access and Manipulate of Image Pixels.
3. Image Transformations.
  - i) Resizing
  - ii) Rotation
4. Addition operation of Two Images.
5. Image filtering operations
  - i) Mean Filtering
  - ii) Gaussian Filtering
6. Image Binarization Using Simple Thresholding method.
7. Edge Detection operation using Sobel and Scharr Gradients.

8. Find Grayscale and RGB Histograms of an Image.
9. Segment an Image using K-means Clustering algorithm.
10. Write a program to classify an Image using KNN Classification algorithm.

**Course Outcome:**

On the successful completion of the course, students will be able to,

|     |                                                                       |       |
|-----|-----------------------------------------------------------------------|-------|
| CO1 | To develop and implement the image loading and exploring              | K1-K6 |
| CO2 | To Evaluate the image transforms                                      |       |
| CO3 | To apply and analyze for image processing denoising algorithms        |       |
| CO4 | To design and develop the Image Segmentation using Edge detection and |       |
| CO5 | To apply and analyze image clustering and classification algorithms   |       |

**K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create**

**Mapping with Programme Outcomes:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | L   | M   | L   | L   | L   | M   | M   | M   | S    | S    | L    |
| CO2 | S   | M   | L   | M   | M   | L   | S   | L   | S   | L    | S    | L    |
| CO3 | S   | S   | S   | M   | M   | L   | M   | L   | M   | L    | M    | L    |
| CO4 | S   | S   | S   | M   | M   | L   | M   | L   | M   | L    | S    | L    |
| CO5 | S   | S   | S   | M   | M   | L   | S   | L   | S   | L    | S    | L    |

L - Low, M- Medium, S - Strong

## Cryptography and Network Security Lab

### Course Objective

- To develop in classical encryption techniques and advanced encryption standards.
- To acquire programming skills in Implement various cryptographic algorithms including secret key cryptography.
- To develop hashes, message digests and public key algorithms.
- Implement different encryption and decryption techniques.
- To comprehend related to confidentiality and authentication techniques.

### Implement the following

1. Write a program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in the string with 0 and display the result
2. Write a program to perform encryption and decryption using the Ceaser Cipher
3. Write a program to perform encryption and decryption using the Hill Cipher
4. Write a program to perform encryption and decryption using the Substitution Cipher
5. Write a program to perform encryption and decryption using the DES algorithm
6. Connect to switch with a computer and enable the port security
7. Defeating malware using Building Trojans and Rootkit hunter
8. Implement signature scheme – Digital Signature Standard
9. Identify and capture the user name and password in a same network using wireshark
10. Implement Man-in-the-middle attack and Session hijacking

### Course Outcomes

On the successful completion of the course, students will be able to

|     |                                                                                                                             |       |
|-----|-----------------------------------------------------------------------------------------------------------------------------|-------|
| CO1 | Comprehend the programming skills in classical encryption techniques and to develop advanced encryption standards           | K1-K6 |
| CO2 | Understand and implement the various cryptographic algorithms including secret key cryptography, hashes and message digests | K1-K6 |
| CO3 | Evaluate the use of different encryption and decryption techniques                                                          | K1-K6 |
| CO4 | Design to Solve related confidentiality and authentication problems                                                         | K1-K6 |
| CO5 | Create public key algorithms                                                                                                | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5-Evaluate, K6- Create**

### Mapping Course outcomes with Programme outcomes

| CO<br>s | PO<br>1 | PO<br>2 | PO<br>3 | PO<br>4 | PO<br>5 | PO<br>6 | PO<br>7 | PO<br>8 | PO<br>9 | PO10 | PO11 | PO12 |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|------|------|
| CO<br>1 | S       | -       | -       | -       | -       | L       | -       | -       | -       | -    | -    | -    |
| CO<br>2 | S       | -       | M       | -       | M       | L       | -       | -       | -       | -    | -    | -    |
| CO<br>3 | S       | -       | S       | -       | S       | L       | -       | -       | -       | S    | S    | S    |
| CO<br>4 | S       | -       | S       | -       | S       | L       | -       | -       | -       | S    | S    | S    |
| CO<br>5 | S       | -       | S       | -       | S       | L       | -       | -       | -       | S    | S    | S    |

**S- Strong; M-Medium; L-Low**

### Block chain Technologies Lab

#### Course Objectives

- To learn the basics of Blockchain and apply cryptographic algorithms
- To design, build, and deploy smart contracts and distributed applications,
- To deploy Private Blockchain and smart contracts on Ethereum.
- To understand and deploy cryptocurrencies and their functions in applications
- To implement Blockchain for various use cases.

#### Implement the following

1. Create a Public Ledger and Private Ledger with the various attributes like Access, Network Actors, Native token, Security, Speed and examples.
2. Building and Deploying MultiChain private Blockchain
3. Write Hello World smart contract in a higher programming language (Solidity)
4. Construct the Naïve block chain
5. Construct and deploy your contract (Use deploy method)
6. Set up a Regtest environment
7. Build a payment request URI
8. Hashcash implementation
9. Develop a toy application using Blockchain
10. Create simple wallet transaction from one account to another account using Metamask.

**Course Outcomes**

On the successful completion of the course, students will be able to:

|      |                                                                                     |       |
|------|-------------------------------------------------------------------------------------|-------|
| CO1: | Enable to setup your own private Blockchain and deploy smart contracts on Ethereum. | K1-K6 |
| CO2: | Gains familiarity and implement with cryptography and Consensus algorithms.         | K1-K6 |
| CO3: | Create and deploy projects using Web3j.                                             | K1-K6 |
| CO4: | Recall and deploy the structure and mechanism of Bitcoin, Ethereum, Hyperledger     | K1-K6 |
| CO5: | Implement Blockchain for various use cases                                          | K1-K6 |

**Mapping with Programme Outcomes:**

|     | PO1 | PO2 | PO <sub>3</sub> | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----------------|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M               | L   | M   | S   | -   | -   | -   | -    | -    | -    |
| CO2 | S   | M   | S               | S   | S   | M   | -   | -   | -   | -    | -    | -    |
| CO3 | S   | S   | S               | S   | S   | S   | -   | -   | -   | -    | -    | -    |
| CO4 | S   | M   | L               | S   | M   | L   | -   | -   | -   | -    | -    | -    |
| CO5 | M   | S   | M               | L   | S   | L   | -   | -   | -   | -    | -    | -    |

S – Strong, M – Medium, L - Low

**Fundamentals of Human Rights****Unit I: Introduction:**

Meaning and Definitions of Human Rights – Characteristics and Importance of Human Rights – Evolution of Human Rights – Formation, Structure and Functions of the UNO - Universal Declaration of Human Rights – International Covenants – Violations of Human Rights in the Contemporary Era.

**Unit II: Human Rights in India:**

Development of Human Rights in India – Constituent Assembly and Indian Constitution – Fundamental Rights and its Classification – Directive Principles of State Policy – Fundamental Duties.

**Unit III:**

**Rights of Marginalized and other Disadvantaged People:** Rights of Women – Rights of Children – Rights of Differently Abled – Rights of Elderly - Rights of Scheduled Castes – Rights of Scheduled Tribes – Rights of Minorities – – Rights of Prisoners – Rights of Persons Living with HIVAIDS – Rights of LGBT.

**Unit IV:**

**Human Rights Movements:** Peasant Movements (Tebhaga and Telangana) – Scheduled Caste Movements (Mahar and Ad-Dharimi) – Scheduled Tribes Movements (Santhal and Munda) – Environmental Movements ( Chipko and Narmada BachaoAndolan) – Social Reform Movements (Vaikom and Self Respect).

**Unit V:**

**Redressal Mechanisms:** Protection of Human Rights Act, 1993 (Amendment 2019) – Structure and Functions of National and State Human Rights Commissions – National Commission for SCs – National Commission for STs – National Commission for Women – National Commission for Minorities – Characteristics and Objectives of Human Rights Education.

**References**

1. SudarshanamGankidi, Human Rights in India: Prospective and Retrospective, Rawat Publications, Jaipur, 2019.
2. SatvinderJuss, Human Rights in India, Routledge, New Delhi, 2020.
3. Namita Gupta, Social Justice and Human Rights in India, Rawat Publications, Jaipur, 2021.
4. Mark Frezo, The Sociology of Human Rights, John Willy & Sons, U.K. 2014.
5. Chiranjivi J. Nirmal, Human Rights in India: Historical, Social and Political Perspectives, Oxford University Press, New York, 2000.
6. Dr. S. Mehartaj Begum, Human Rights in India: Issues and perspectives, APH Publishing Corporation, New Delhi, 2010.
7. Asha Kiran, The History of Human Rights, Mangalam Publications, Delhi, 2011.
8. Bani Borgohain, Human Rights, Kanishka Publishers & Distributors, New Delhi-2, 2007.
9. Jayant Chudhary, A Textbook of Human Rights, Wisdom Press, New Delhi, 2011.

**Semester III**

**Advanced Java Programming**

**Course Objectives**

- To gain knowledge of Object Oriented Programming Concept in Java
- To understand usages of String functions in Java
- To familiarize with the applet and swing
- To grasp the concepts on Java Beans
- To comprehend the connection between Relational Database and Java.

## **Unit – I**

An Overview of Java: Object Oriented Programming- Data Types, Variables, and Arrays: Primitive Types-Literals Variables - Type Conversion and Casting- Arrays-Operators: Control Statements-Classes and Methods – Inheritance- Exception Handling.

## **Unit – II**

String Handling: The String Constructors - String Length - Special String Operations - Character Extraction - String Comparison - Searching Strings - Modifying a String - Input/Output: The I/O Classes and Interfaces – File - Byte Streams - Character Streams.

## **Unit – III**

The Applet Class: Basic Architecture - Applet Skeleton - Display methods - Status Window – Passing Parameters. Introducing GUI Programming with Swing– Introducing Swing - Swing Is Built on the AWT- Two Key Swing Features - The MVC Connection - Components and Containers - The Swing Packages - A Simple Swing Application - Exploring Swing.

## **Unit- IV**

Java Beans: Introduction - Advantages of Beans – Introspection - The JavaBeans API - A Bean Example. Servlets: Life Cycle Simple Servlet-Servlet API-Packages-Cookies session tracking.

## **Unit – V**

Network Programming: Working with URLs- Working with Sockets - Remote Method Invocation. Introduction to Database Management Systems - Tables, Rows, and Columns - Introduction to the SQL SELECT Statement - Inserting Rows - Updating and Deleting Existing Rows - Creating and Deleting Tables - Creating a New Database with JDBC - Scrollable Result Sets.

### **Text Books:**

1. Herbert Schildt, “Java the Complete Reference”, 10<sup>th</sup> edition, McGraw Hill Publishing Company Ltd, New Delhi, 2017.
2. Tony Goddis, “Starting out with Java from Control Structures Through Objects” 6th Edition, Pearson Education Limited, 2016

### **Reference books :**

1. Herbert Schildt, Dale Skrien, “Java Fundamentals – A Comprehensive Introduction”, TMGH Publishing Company Ltd, New Delhi, 2013
2. John Dean, Raymond Dean, “Introduction to Programming with JAVA – A Problem Solving Approach”, TMGH Publishing Company Ltd, New Delhi, 2012.

### **Course Outcomes**

**On the successful completion of the course, students will be able**

|      |                                                                                                          |        |
|------|----------------------------------------------------------------------------------------------------------|--------|
| CO1: | Understand the Object Oriented Program including classes and methods; inheritance and exception handling | K1-K6  |
| CO2: | Complete comprehension of String functions and I/O Streams                                               | K1-K6  |
| CO3: | Creation of graphical representation using Applet                                                        | K1-K6  |
| CO4: | Application of Servlets for designing Web based applications                                             | K1- K6 |
| CO5: | Usage of JDBC connectivity and implementation of the concept to get desired results from database        | K1-K6  |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### **Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | S   | -   | M   | S   | -   | -   | -   | S    | M    | -    |
| CO2 | S   | S   | S   | -   | M   | S   | -   | -   | -   | L    | M    | -    |
| CO3 | S   | S   | M   | -   | L   | S   | -   | -   | -   | M    | M    | -    |
| CO4 | M   | S   | M   | -   | S   | S   | -   | -   | -   | M    | S    | -    |
| CO5 | S   | M   | M   | -   | M   | L   | -   | -   | -   | M    | M    | -    |

**S- Strong; M-Medium; L-Low**

## **Web Technology**

### **COURSE OBJECTIVES:**

- Understand the fundamentals of the web and thereby develop web applications using various development languages and tools.
- Enrich knowledge about XHTML control and Cascading Style Sheets.
- Provide in- depth knowledge about Javascript.
- To enhance knowledge in XML documents with presentations using CSS and XSLT.
- Deliver depth knowledge about PHP, Angular JS, JQuery.

### **UNIT -I**

**WEB FUNDAMENTALS AND HTML:** A Brief Introduction to the Internet - The World Wide Web - Web Browsers - Web Servers -URLs, MIME, HTTP, Security- Introduction to HTML- Origins and Evolution of HTML and HTML - Basic Syntax - Standard HTML Document Structure - Basic Text Markup - Images- Hypertext Links - Lists, Tables, Forms, The Audio Element, The Video Element - Organization Elements, The Time Element

## **UNIT – II**

**INTRODUCTION TO XHTML AND CSS:** Basic syntax, Standard structure, Basic text-markup, Images, Hypertext Links. Lists, Tables, Forms, Frames, syntactic differences between HTML and XHTML-Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The <span> and <div>tags, Conflict resolution.

## **UNIT - III**

**THE BASICS OF JAVASCRIPT:** Overview of JavaScript, Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts.

**JAVASCRIPT AND XHTML DOCUMENTS:** The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Model

## **UNIT- IV**

**DYNAMIC DOCUMENTS WITH JAVASCRIPT AND XML:** Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Color and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements. Introduction to XML, Syntax of XML, XML Document Structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, XSLT Style Sheets, Web services.

## **UNIT - V**

**PHP, ANGULAR JS AND JQUERY:** Introduction to PHP: Overview of PHP -General Syntactic Characteristics - Primitives, Operations, and Expressions - Output - Control Statements - Arrays - Functions - Pattern Matching - Form Handling - Cookies - Session Tracking - Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS. Introduction to Angular JS, Directives, Expressions, Controllers, Filters, Services, Events, Forms, Validations, Examples.

## **TEXT BOOKS:**

1. Robert W. Sebesta: Programming the World Wide Web, Eighth Edition, Pearson education, 2015. **UNITS:** 1,2,3,4

- Dayley Brad, Dayley Brendan ,”AngularJS, JavaScript, and jQuery All in One”, Sams Teach Yourself 1st Edition, Kindle Edition, 2015.**UNIT: 5**

#### REFERENCE BOOKS:

- M. Srinivasan: Web Programming Building Internet Applications, 3<sup>rd</sup> Edition, Wiley India, 2009.
- Jeffrey C. Jackson: Web Technologies-A Computer Science Perspective, Pearson Education, 7<sup>th</sup> Impression, 2012.
- Chris Bates: Web Technology Theory and Practice, Pearson Education, 2012.
- Raj Kamal: Internet and Web Technologies, McGraw Hill Education.

#### COURSE OUTCOMES:

On the successful completion of the course, students will be able

|     |                                                                          |        |    |
|-----|--------------------------------------------------------------------------|--------|----|
| CO1 | Design dynamic web pages using Javascript, JQuery and Angular JavaScript | K1     | LO |
| CO2 | Develop Web pages using HTML, CSS and XML                                | K2     | IO |
| CO3 | Create web application using PHP and MySQL                               | K3, K4 | HO |
| CO4 | To design dynamic web pages using Angular javascript                     | K2, K3 | HO |
| CO5 | Develop interactive web pages using JQuery                               | K4, K5 | HO |

#### MAPPING WITH PROGRAMME OUTCOMES

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | M   | S   | S   | S   | S   | M   | M   | S   | M   | M    | S    | S    |
| CO2 | S   | S   | M   | S   | S   | S   | M   | S   | S   | S    | S    | S    |
| CO3 | S   | S   | S   | M   | S   | S   | M   | M   | S   | M    | M    | S    |
| CO4 | S   | S   | S   | M   | S   | M   | M   | S   | S   | M    | S    | M    |
| CO5 | S   | S   | S   | M   | S   | S   | M   | S   | M   | S    | S    | M    |

**S- STRONG; M-MEDIUM; L-LOW**

## **Advanced Machine Learning**

### **Course Objectives**

- To understand the concepts of Machine Learning.
- To understand the theoretical and practical aspects of types of machine learning
- To teach and get familiarized with supervised learning and their applications.
- To teach and get familiarized with the concepts and algorithms of unsupervised learning.
- To appreciate the concepts and algorithms of deep learning.

### **Unit I:**

**Introducing Machine Learning:** The Origins of Machine Learning, Uses and Abuses of Machine Learning \_ Basics of Machine Learning Algorithm Model Works - Steps to apply Machine Learning - Choosing a Machine Learning Algorithm - Using Machine Learning concepts.

**Managing and Understanding Data:** Data Structures, Vectors And Factors: Lists, Data frames, Matrixes and arrays - Managing Data - Exploring and Understanding Data: Exploring the Structure of Data, Exploring Numeric variables - Exploring Categorical Variables- Exploring Relationships between Variables.

### **Unit II:**

Lazy Learning – **Classification Using Nearest Neighbors:** The kNN Algorithm- Diagnosing Breast Cancer with the kNN Algorithm- Probabilistic Learning – Classification Using Naive Bayes: Basic concepts of Bayesian Methods- The Naïve Bayes Algorithm- Example – filtering Mobile Phone Spam with the Naive Bayes Algorithm.

Divide and Conquer – **Classification Using Decision Trees and Rules:** Understanding Decision Trees- Example – Identifying Risky Bank Loans using C5.0 Decision Trees- Understanding Classification Rules- Example – Identifying Poisonous Mushrooms with Rule Learners.

### **Unit III:**

Forecasting Numeric Data – **Regression Methods:** Understanding Regression- Example – Predicting Medical Expenses using Linear Regression- Understanding Regression Trees and Model Trees- Example – Estimating the Quality of Wines with Regression Trees and Model Trees.

Black Box Methods Neural Networks and Support Vector Machines: Understanding Neural Networks, from Biological to Artificial Neurons, Activation Functions, Network Topology, Training Neural Networks with Back propagation - Modeling the Strength of Concrete with ANNs- Understanding Support Vector Machines- Performing OCR with SVMs- Finding Patterns – Market Basket Analysis Using Association Rules: Understanding Association Rules- Example – Identifying Frequently Purchased Groceries with Association Rules.

## Unit IV:

Finding Groups of Data – **Clustering with K-Means:** Understanding Clustering- The k-means Algorithm for clustering- Finding teen market segments using k-means Clustering- Evaluating Model Performance: Measuring Performance for Classification- Beyond Accuracy – other Measures of Performance, Visualizing Performance Tradeoffs.

Improving Model Performance: Tuning Stock Models for Better Performance-Using Caret for Automated Parameter Tuning- Creating a simple Tuned Model- Customizing the Tuning Process-Improving Model Performance with meta-learning- Understanding Ensembles- Bagging- Boosting- Random forests.

## Unit V:

**Introduction to Deep Learning:** Introduction to Deep Learning, Single Layer Perceptron Model (SLP), Multilayer Perceptron Model (MLP), Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Restricted Boltzmann Machines (RBMs).

**Convolutional Neural Networks (CNNs):** Structure and Properties of CNNs - Components of CNN Architectures- Convolutional Layer, Pooling Layer, Rectified Linear Units (ReLU) Layer, Fully Connected (FC) Layer, Loss Layer - Tuning Parameters ,Notable CNN Architectures, Regularization- Recurrent Neural Networks (RNNs): Fully Recurrent Networks, Training RNNs with Back-Propagation Through Time (BPPT)- Elman Neural Networks, Neural History Compressor, Long Short-Term Memory (LSTM), Traditional and Training LSTMs - Structural Damping Within RNNs, Tuning Parameter Update Algorithm.

## Text Books:

1. Brett Lantz, “Machine Learning with R”, Addison-Wesley Packt Publishing, 2013.
2. TawehBeysolow, “Introduction to Deep Learning Using R: A Step-by-Step Guide to Learning and Implementing Deep Learning Models Using R”, San Francisco, California, USA, 2017.

## Reference Books:

1. Daniel T. Larose, Chantal D. Larose, “Data mining and Predictive analytics”, Second Ed., Wiley Publication, 2015.
2. Bertt Lantz, “Machine Learning with R: Expert techniques for predictive modeling”, 3rd Edition, April 15, 2019,
3. Jason Bell, “Machine Learning: Hands-On for Developers and Technical Professionals”, Wiley Publication, 2015.

## Course Outcomes

**On the successful completion of the course, students will be able to**

|     |                                                                                                     |              |
|-----|-----------------------------------------------------------------------------------------------------|--------------|
| CO1 | To understand, impart and analyze the concepts and of Machine Learning Techniques and types of data | <b>K1-K6</b> |
| CO2 | To comprehend, apply and evaluate the classification techniques for real-world applications         | <b>K1-K6</b> |
| CO3 | To understand, use and perform evaluation of Regression methods                                     | <b>K1-K6</b> |

|     |                                                                                                       |              |
|-----|-------------------------------------------------------------------------------------------------------|--------------|
| CO4 | To recognize, implement and analyse the unsupervised techniques for real-world applications           | <b>K1-K6</b> |
| CO5 | To understand, identify, implement and review the deep learning techniques for real-time applications | <b>K1-K6</b> |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

#### **Mapping with Programme Outcomes**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | -   | -   | S   | L   | -   | S   | -   | -    | -    | -    |
| CO2 | S   | S   | M   | -   | S   | L   | -   | S   | -   | -    | -    | -    |
| CO3 | S   | S   | S   | -   | S   | L   | -   | S   | -   | S    | S    | S    |
| CO4 | S   | S   | M   | -   | S   | L   | -   | S   | -   | -    | -    | -    |
| CO5 | S   | S   | S   | -   | S   | L   | -   | S   | -   | S    | S    | S    |

**S- Strong; M-Medium; L-Low**

### **Advanced Java Programming Lab**

#### **COURSE OBJECTIVES:**

- To implement object oriented concepts in JAVA
- Develop the program using concepts Network programme
- Learn how to create a program in java beans.
- Learn how to connect relational database to Java
- Develop the program using concepts Applet

#### **List of Experiments:**

1. Implementation of and Exception handling concepts with different type of Exception.
2. Build a Swing application to implement metric conversion.
3. Use Grid Layout to design a calculator and simulate the functions of a simple calculator.
4. Create a Color palette with a matrix of buttons using Applet.
5. To invoke a servlet from HTML forms.
6. To invoke servlet from Applets.
7. To invoke servlet from JSP.
8. Implement message communication using Network Programming.

9. Write a program to connect databases using JDBC.
10. Implementation of Java Beans.

### Course Outcomes

On the successful completion of the course, students will be able to

|      |                                                                                                                                       |        |    |
|------|---------------------------------------------------------------------------------------------------------------------------------------|--------|----|
| CO1: | Implement classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem | K1, K2 | LO |
| CO2: | Apply Applets and Swing programs                                                                                                      | K3     | IO |
| CO3: | Develop Servlets and JSP for creating Web based applications using JDBC                                                               | K4, K5 | HO |

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

### Mapping with Programme Outcomes

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 |     |     |     |     |     |     |     |     |     |      |      |      |
| CO2 |     |     |     |     |     |     |     |     |     |      |      |      |
| CO3 |     |     |     |     |     |     |     |     |     |      |      |      |

**S- Strong; M-Medium; L-Low**

### Web Technologies Lab

#### COURSE OBJECTIVES:

**At the end of the course, the student should be able to do:**

- Learn how to create web pages using HTML, CSS and Javascript.
- Implement dynamic web pages using Javascript, JQuery and Angular Java script
- To create web applications using PHP and MySQL
- Create web pages using XML and Cascading Style Sheets
- Create XML documents and Schemas.

#### PROGRAM LIST

1. Develop a web page to display your education details in a tabular format.
2. Develop a web page to display your CV on a web page.

3. Design a Homepage having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.
4. Design a web page to demonstrate the usage of inline CSS, internal CSS and external CSS.
5. Design an XML document and create a style sheet in CSS & display the document in the browser.
6. Develop a web page to Create image maps.
7. Design a web page to perform input validation using Angular Javascript.
8. Develop a web page in PHP to fetch details from the database.
9. Design a web page to hide paragraph using JQuery
10. Create a web page and add Javascript to handle mouse events and form events

### **COURSE OUTCOMES:**

On the successful completion of the course, students will be able

|            |                                                                          |        |    |
|------------|--------------------------------------------------------------------------|--------|----|
| <b>CO1</b> | Design dynamic web pages using JavaScript, JQuery and Angular JavaScript | K1     | LO |
| <b>CO2</b> | Develop Web pages using HTML, CSS and XML                                | K2     | IO |
| <b>CO3</b> | Create web application using PHP and MySQL                               | K3, K4 | HO |
| <b>CO4</b> | Develop interactive web pages using JQuery                               | K2, K3 | HO |
| <b>CO5</b> | To design dynamic web pages using Angular javascript                     | K4, K5 | HO |

### **MAPPING WITH PROGRAMME OUTCOMES**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | M   | S   | S   | S   | S   | M   | M   | S   | M   | M    | S    | M    |
| CO2 | S   | S   | M   | S   | S   | S   | M   | S   | S   | S    | M    | S    |
| CO3 | S   | S   | S   | M   | M   | S   | M   | M   | S   | M    | M    | S    |

|     |   |   |   |   |   |   |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|
| CO4 | S | M | S | M | S | M | M | S | S | M | S | M |
| CO5 | M | M | S | M | S | S | M | S | M | M | S | M |

**S- STRONG; M-MEDIUM; L-LOW**

### **Integrated Technology (AML) Lab**

#### **Course Objectives**

- To formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To apply machine learning algorithms to solve problems of moderate complexity.
- To apply CNN to solve problems of moderate complexity.
- To apply LSTM and RNN to solve problems.

#### **List of Programs**

1. Write a python program to compute the Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation
2. Implement a Linear Regression and Multiple Linear Regression with a Real Dataset
3. Implementation of Logistic Regression using sklearn
4. Implement a binary classification model.
5. Classification with Nearest Neighbours and NavieBaye Algorithm
6. Implementation Decision tree for classification using sklearn and its parameter tuning
7. Implement the k-means algorithm.
8. Implement an Image Classifier using CNN in TensorFlow/Keras.
9. Implement an Autoencoder in TensorFlow/Keras.
10. Implement a SimpleLSTM using TensorFlow/Keras.

#### **Course Outcomes**

**On the successful completion of the course, students will be able to**

|            |                                                                                                                                    |              |
|------------|------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>CO1</b> | To understand and implement the mathematical and statistical prospective of machine learning algorithms through python programming | <b>K1-K6</b> |
| <b>CO2</b> | To recognize and develop the machine learning models through python in built functions                                             | <b>K1-K6</b> |
| <b>CO3</b> | To understand, impart and develop the machine learning models for real-time dataset                                                | <b>K1-K6</b> |
| <b>CO4</b> | To comprehend , impart and implement the deep learning models for real-time applications                                           | <b>K1-K6</b> |

|            |                                                                                        |              |
|------------|----------------------------------------------------------------------------------------|--------------|
| <b>CO5</b> | To identify and evaluate the performance machine learning models for real-time dataset | <b>K1-K6</b> |
|------------|----------------------------------------------------------------------------------------|--------------|

**K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create**

Mapping with Programme Outcomes

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | S   | -   | S   | -   | -   | -   | M   | -    | -    | -    |
| CO2 | S   | S   | S   | -   | S   | -   | -   | -   | M   | -    | -    | -    |
| CO3 | S   | S   | S   | -   | S   | -   | -   | -   | M   | S    | S    | S    |
| CO4 | S   | S   | S   | -   | S   | -   | -   | -   | M   | -    | -    | -    |
| CO5 | S   | S   | S   | -   | S   | -   | -   | -   | M   | S    | S    | S    |

**S- Strong; M-Medium; L-Low**

## Semester IV

### **Industry Dynamics Technology-Data Visualisation (Mobile Computing)**

#### **Course Objective:**

- To introduce the concepts of wireless devices with signal, Antenna, Radio Frequencies, Signal Propagation.
- To introduce wireless communication and networking principles, that support connectivity to cellular networks, Wireless LAN, GSM, CDMA.
- To introduce the WAP Architecture, MANET and Routing

#### **Unit-I**

Introduction – Applications – History of wireless communication – A Simplified reference model - Wireless transmission – Frequencies for radio transmission – Regulations – Signals –Antennas - Signal propagation: Path loss of radio signals - Additional signal propagation effects - Multi-path propagation – Multiplexing –Modulation Chapters: 1, 2.1 to 2.6

#### **Unit-II**

Spread spectrum – Direct sequence spread spectrum – Frequency hopping spread spectrum – Cellular systems. Medium access control: Hidden and exposed terminals – Near and far terminals – SDMA, FDMA, TDMA, Fixed TDM, Classical Aloha, slotted Aloha, Carrier sense multiple access – Reservation TDMA – Multiple access with collision avoidance – Polling – CDMA – Spread Aloha multiple access. Chapters: 3.1 to 3.3, 3.4.1 to 3.4.4, 3.4.7 to 3.4.9, 3.5.1

#### **Unit-III**

GSM - Mobile services – System architecture – Radio interface – Protocols – Localization and calling – Handover – Security – New Data services. UMTS and IMT-2000 - Satellite Systems: Applications – Basics – Routing – Localization – Handover.Chapters: 3.6, 4.1.1 to 4.1.8, 4.4, 5.2 to 5.6

#### **Unit-IV**

Wireless LAN: Infra red vs. radio transmission – Infrastructure and ad-hoc network – IEEE 802.11 – System architecture – Protocol architecture – Physics layer – Medium access control layer – MAC management – Blue tooth. Mobile network layer: Mobile IP: Goals, assumptions and requirements – entities and terminology – packet delivery – Agent discovery – Registration – Tunneling and encapsulation Recent technologies Chapters: 7.1 to 7.3.5, 7.5, 8.1.1 to 8.1.6

#### **Unit-V**

WAP: Architecture – wireless datagram Protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Mobile ad-hoc networks – MANET Characteristics – Classification of MANETs, Routing of MANETs, Proactive Routing Protocol - DSDV, Reactive Routing Protocols – DSR, AODV.Chapter10.3.1 to 10.3.6 (Text Book 2- 6.1, 6.2, 6.4, 6.5, 6.6)

#### **Course Outcomes:**

- On the successful completion of the course, students will be able to:
- Understanding the basic concepts of Wireless Communication
  - Understanding the basic concepts of Spread Spectrum

- Analyzing the concepts of Medium Access Control
- Analyzing the concepts of Global System for Mobile Communication
- Understanding the basic concepts of Wireless LAN
- Understanding the basic concepts of Mobile Network Layer
- Understanding the basic concepts of Wireless Application Protocol
- Analyzing the concepts of Routing Protocols in MANET

#### Text Book:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2013.
2. KumKumGarg, “Mobile Computing Theory and Practice”, Pearson Education, 2014.

#### Reference Books:

1. Rifaat A. Dayen, “Mobile Data & Wireless LAN Technologies”, Prentice Hall, 1997.
2. Steve Mann and Scoot Schibli, “The Wireless Application Protocol”, John Wiley & Inc., 2000.

#### Course Outcomes:

On the successful completion of the course, students will be able to

|     |                                                                                                                                                                          |            |    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----|
| CO1 | Understanding the basic concepts of Mobile and Wireless Communication                                                                                                    | K1, K2     | LO |
| CO2 | Understanding the basic concepts of Spread Spectrum. Analyzing the concepts of Medium Access Control.                                                                    | K3         | IO |
| CO3 | Analyzing the concepts of Global System for Mobile Communication and Satellite Communications. Understanding the basic concepts of Wireless LAN                          | K4         | HO |
| CO4 | Understanding the basic concepts of Wireless LAN. Evaluate the performance of Mobile Network Layer                                                                       | K2, K5     | HO |
| CO5 | Understanding the basic concepts of Wireless Application Protocol and create a MoileApp with real time application. Analyzing the concepts of Routing Protocols in MANET | K2, K4, K6 | HO |

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create

#### Mapping Course outcomes with Programme outcomes

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | L   | -   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    |
| CO2 | S   | M   | M   | M   | M   | -   | M   | -   | -   | -    | -    | -    |

|     |   |   |   |   |   |   |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|
| CO3 | S | M | M | M | M | - | M | - | - | L | - | M |
| CO4 | S | M | M | M | M | - | M | - | - | L | - | M |
| CO5 | S | M | M | M | M | - | M | - | - | L | - | M |

3. S- Strong; M-Medium; L-Low

## **SOFTWARE PROJECT MANAGEMENT**

### **Course Objectives:**

- To define and highlight importance of software project management.
- To formulate and define the software management metrics & strategy in managing projects
- Understand to apply software testing techniques in commercial environment

### **Unit I**

Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.

### **Unit II**

Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software..

### **Unit III**

Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.

### **Unit IV**

Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.

### **Unit V**

Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study

**Text Book:**

Robert T. Futrell, Donald F. Shafer, Linda I. Safer, “Quality Software Project Management”, Pearson Education Asia 2002.

**Reference Books**

1.Pankaj Jalote, “Software Project Management in Practice”, Addison Wesley 2002.

2.Hughes, “Software Project Management”, Tata McGraw Hill 2004, 3rd Edition.

| CO  | Course Outcomes                                                          |       |
|-----|--------------------------------------------------------------------------|-------|
| CO1 | Understand the principles and concepts of project management             | K1-K6 |
| CO2 | Knowledge gained to train software project managers                      | K1-K6 |
| CO3 | Apply software project management methodologies.                         | K1-K6 |
| CO4 | Able to create comprehensive project plans                               | K1-K6 |
| CO5 | Evaluate and mitigate risks associated with software development process | K1-K6 |

| MAPPING TABLE |      |       |       |       |       |       |
|---------------|------|-------|-------|-------|-------|-------|
| CO/PSO        | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
| CO1           | 2    | 2     | -     | 3     | 3     | 1     |
| CO2           | 2    | 1     | -     | 3     | 3     | -     |
| CO3           | 3    | -     | 1     | 2     | 3     | 3     |
| CO4           | 2    | 3     | 2     | 3     | 2     | -     |
| CO5           | 2    | 2     | -     | 3     | 3     | 3     |

**Social Networking Lab****Course Objectives**

- To familiarize the tools required to manage social network applications
- To analyze social networks like Facebook, LinkedIn, Google+, GitHub
- To teach the fundamental techniques and principles in achieving social networking environment.
- To enable students to have skills that will help them to solve real time applications.

- To get explore in the Github API.

### List of Programs

1. Creating and Exploring Twitter's API
2. To analyzing and visualizing tweets and tweet entities with frequency analysis
3. Creating and Exploring Facebook's Social Graph API
4. To analyzing the Facebook's Social Graph connections
5. Creating and Exploring LinkedIn API
6. To downloading LinkedIn connections as a CSV file
7. Creating and Exploring Google+ API
8. To create and querying Human Language Data with TF-IDF
9. Creating and Exploring GitHub's API
10. To analyzing GitHub interest graph

### Course Outcomes

On the successful completion of the course, students will be able to

|      |                                                                                                                                           |       |
|------|-------------------------------------------------------------------------------------------------------------------------------------------|-------|
| CO1: | To understand , implement and review the fundamental techniques and principles for social networks.                                       | K1-K6 |
| CO2: | To design and develop the programs using the tools required to develop and manage social network like Facebook, LinkedIn, Google+, GitHub | K1-K6 |
| CO3: | To create and explore the functionality of social networking tools such as GitHub                                                         | K1-K6 |
| CO4  | To understand , implement and review the fundamental principles for social network graph.                                                 | K1-K6 |
| CO5  | To comprehend and critically analyse the existing API for social networks                                                                 | K1-K6 |

**K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create**

### Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | S   | M   |     | M   | S   | -   | -   | -   | S    | -    | -    |
| CO2 | S   | M   | S   | S   | S   | M   | -   | -   | -   | S    | -    | -    |
| CO3 | S   | S   | S   | S   | S   | S   | -   | -   | -   | S    | S    | S    |
| CO4 | S   | M   | S   | S   | S   | M   | -   | -   | -   | S    | -    | -    |
| CO5 | S   | S   | S   | S   | S   | S   | -   | -   | -   | S    | S    | S    |

**S- Strong; M-Medium; L-Low**

## High Performance Computing Lab

### Course Objectives:

- To understand concepts of High Performance Computing.
- To get brief knowledge about PB and Slurm.
- To understand techniques of OpenMP and OpenMPI.
- To understand Parallel computing concepts.
- To get familiar with CUDA.

(Implemented either PB, Slurm, OpenMP, OpenMPI, and CUDA)

1. Demo: - Access and best practices on HPC
2. Matrix multiplication with Job scheduling (PB or Slurm)
3. Vectors add with malloc shared
4. Vector add program with MPI
5. Hello world task for Multithreading with openMP
6. openMP shared memory on Host and Device
7. openMP Matrix Multiplication with parallelism and Barrier
8. openMP with Reduction on operands and aggregate functionality
9. Vector and Matrix multiplication on CUDA
10. Feed forward computing on CUDA

### Course Outcome:

On the successful completion of the course, students will be able to,

|     |                                                               |         |
|-----|---------------------------------------------------------------|---------|
| CO1 | Apply and Evaluate the HPC Programs                           | K1 - K6 |
| CO2 | Design and Develop a MPI Programs                             |         |
| CO3 | Design and Develop a different programming concepts of OpenMP |         |
| CO4 | Develop an efficient PB and Slurm programming                 |         |
| CO5 | Evaluate an efficient CUDA programming                        |         |

**1- Remember, K2 - Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 - Create**

### Mapping with Programme Outcomes:

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | S   | L   | M   | L   | L   | L   | S   | S   | S   | S    | M    | L    |
| CO2 | S   | M   | L   | M   | M   | L   | S   | L   | S   | L    | S    | L    |
| CO3 | S   | S   | S   | M   | M   | L   | M   | L   | M   | L    | S    | L    |
| CO4 | S   | S   | S   | M   | S   | L   | M   | L   | M   | S    | S    | S    |
| CO5 | S   | S   | S   | M   | M   | L   | M   | M   | M   | M    | S    | L    |

**L - Low, M- Medium, S - Strong**