

# **JP COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)**

*(Run by DMI Sisters)*

**(Affiliated to Manonmaniam Sundaranar University – Tirunelveli)**

**Accredited by NAAC with “B++” Grade**

**2(f) status of UGC Act, 1956 | ISO 9001:2015 Certified Institution**

**Ayikudy, Tenkasi District - 627852.**

## **SYLLABUS**



### **Bachelor of Science Information Technology**

**Choice Based Credit System (CBCS)**

**(w.e.f. June 2026-2027)**



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### **Preamble:**

- The Learning Outcome-based Curriculum Framework (LOCF) has been adopted for the B.Sc. Information Technology Programme to systematically impart contemporary technological knowledge. The programme is designed to develop industry-relevant technical competencies and to equip graduates with essential employability skills by the time of completion of the degree.

### **Vision**

- To be a pioneer in Information Technology that provide technological excellence in learning, teaching, research and development of students, in alignment with the technological perspectives.

### **Mission**

- To foster a learning environment that integrates theoretical knowledge and practical skills, empowering students to tackle real-world IT challenges with integrity.
- To empower students with strong foundation of both technical skills and ethical principles for well-rounded personal and professional growth in IT.
- To prepare students for careers in IT by emphasizing innovation, collaboration, and ethical responsibility in all professional activity.



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## SYLLABUS

### PROGRAMME OUTCOMES (PO) FOR UG PROGRAMME

The successful completion of the B.Sc Information Technology programme shall enable the students to:

|            |                                                                                                                                                                   |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PO1</b> | <b>Knowledge</b> – Gain in-depth knowledge of software and hardware techniques.                                                                                   |
| <b>PO2</b> | <b>Problem Solving</b> – Ability to critically analyze and provide software solutions for problems.                                                               |
| <b>PO3</b> | <b>Environment and Sustainability</b> – Understand the impact of software solutions in environmental and societal context and strive for sustainable development. |
| <b>PO4</b> | <b>Team Work</b> – Work in teams to accomplish the objective.                                                                                                     |
| <b>PO5</b> | <b>Communication Skills</b> – Able to communicate effectively.                                                                                                    |
| <b>PO6</b> | <b>Ethics and Lifelong Learning</b> - Apply ethical values in computing practices and engage in continuous learning to adapt to emerging technologies.            |

### PROGRAMME SPECIFIC OUTCOMES (PSOs) FOR UG

|              |                                                                                                                                                     |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PSO 1</b> | Understand and analyze the fundamental knowledge in the Information Technology domain.                                                              |
| <b>PSO 2</b> | Enhance logical and analytical thinking to understand computational systems.                                                                        |
| <b>PSO 3</b> | Ability to comprehend the development methodologies of software systems and to design software solutions.                                           |
| <b>PSO 4</b> | Explore developing areas in the Information Technology sector and enrich themselves to meet the diverse expectations of the industry.               |
| <b>PSO 5</b> | Be competent in providing optimal and ethical solutions to technological challenges in professional societies.                                      |
| <b>PSO6</b>  | Develop skills in modern tools, communication, teamwork, and lifelong learning to build successful careers in the IT industry and entrepreneurship. |

**Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework  
(LOCF) Guideline Based Credit and Hours Distribution System**

**For all UG courses including Lab Hours**

**First Year – Semester-I**

| <b>Part</b> | <b>List of Courses</b>                     | <b>Credit</b> | <b>No. of Hours</b> |
|-------------|--------------------------------------------|---------------|---------------------|
| Part-1      | Language – Tamil                           | 3             | 5                   |
| Part-2      | English                                    | 3             | 5                   |
| Part-3      | Core Courses & Elective Courses [in Total] | 11            | 14                  |
| Part-4      | Skill Enhancement Course SEC-1             | 2             | 2                   |
|             | Foundation Course                          | 2             | 2                   |
|             | Non Major Elective-I                       | 2             | 2                   |
|             |                                            | <b>23</b>     | <b>30</b>           |

**Semester-II**

| <b>Part</b> | <b>List of Courses</b>                                             | <b>Credit</b> | <b>No. of Hours</b> |
|-------------|--------------------------------------------------------------------|---------------|---------------------|
| Part-1      | Language – Tamil                                                   | 3             | 5                   |
| Part-2      | English                                                            | 3             | 5                   |
| Part-3      | Core Courses & Elective Courses including laboratory [in Total]    | 11            | 14                  |
| Part-4      | Skill Enhancement Course -SEC-2                                    | 2             | 2                   |
|             | Skill Enhancement Course -SEC-3<br>(Discipline / Subject Specific) | 2             | 2                   |
|             | Non Major Elective -II                                             | 2             | 2                   |
|             |                                                                    | <b>23</b>     | <b>30</b>           |

**Second Year – Semester-III**

| <b>Part</b> | <b>List of Courses</b>                                             | <b>Credit</b> | <b>No. of Hours</b> |
|-------------|--------------------------------------------------------------------|---------------|---------------------|
| Part-1      | Language - Tamil                                                   | 3             | 5                   |
| Part-2      | English                                                            | 3             | 5                   |
| Part-3      | Core Courses & Elective Courses including laboratory [in Total]    | 11            | 14                  |
| Part-4      | Skill Enhancement Course -SEC-4<br>(Entrepreneurial Based)         | 2             | 2                   |
|             | Skill Enhancement Course -SEC-5<br>(Discipline / Subject Specific) | 2             | 2                   |
|             | Environmental Studies                                              | 2             | 2                   |
|             |                                                                    | <b>23</b>     | <b>30</b>           |

**Semester-IV**

| <b>Part</b> | <b>List of Courses</b>                                                | <b>Credit</b> | <b>No. of Hours</b> |
|-------------|-----------------------------------------------------------------------|---------------|---------------------|
| Part-1      | Language - Tamil                                                      | 3             | 5                   |
| Part-2      | English                                                               | 3             | 5                   |
| Part-3      | Core Courses & Elective Courses including laboratory [in Total]       | 11            | 14                  |
| Part-4      | Skill Enhancement Course -SEC-5<br>(Discipline / Subject Specific)    | 2             | 2                   |
|             | Skill Enhancement Course -SEC-6 &7<br>(Discipline / Subject Specific) | 2             | 2                   |
|             | Value Based Education                                                 | 2             | 2                   |
|             |                                                                       | <b>23</b>     | <b>30</b>           |

**Third Year-Semester-V**

| <b>Part</b> | <b>List of Courses</b>                          | <b>Credit</b> | <b>No. of Hours</b> |
|-------------|-------------------------------------------------|---------------|---------------------|
| Part-3      | Core Courses including Project / Elective Based | 22            | 28                  |
| Part-4      | AEC-I                                           | 2             | 2                   |
|             | Internship / Industrial Visit / Field Visit     | 2             | -                   |
|             |                                                 | <b>26</b>     | <b>30</b>           |

**Semester-VI**

| <b>Part</b> | <b>List of Courses</b>                                | <b>Credit</b> | <b>No. of Hours</b> |
|-------------|-------------------------------------------------------|---------------|---------------------|
| Part-3      | Core Courses including Project / Elective Based & Lab | 23            | 28                  |
| Part-4      | AEC-II                                                | 2             | 2                   |
| Part-5      | Extension Activity                                    | 1             | -                   |
|             |                                                       | <b>26</b>     | <b>30</b>           |

**Consolidated Semester wise and Component wise Credit distribution**

| <b>Parts</b>    | <b>Sem I</b> | <b>Sem II</b> | <b>Sem III</b> | <b>Sem IV</b> | <b>Sem V</b> | <b>Sem VI</b> | <b>Total Credits</b> |
|-----------------|--------------|---------------|----------------|---------------|--------------|---------------|----------------------|
| <b>Part I</b>   | 3            | 3             | 3              | 3             | -            | -             | 12                   |
| <b>Part II</b>  | 3            | 3             | 3              | 3             | -            | -             | 12                   |
| <b>Part III</b> | 11           | 11            | 11             | 11            | 22           | 23            | 89                   |
| <b>Part IV</b>  | 6            | 6             | 6              | 6             | 4            | 2             | 30                   |
| <b>Part V</b>   | -            | -             | -              | -             | -            | 1             | 01                   |
| <b>Total</b>    | 23           | 23            | 23             | 23            | 26           | 26            | <b>144</b>           |

**\*Part I, II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

**Part I** – Tamil / Other Languages

**Part II** - English

**Part III** – Core Papers, Electives and Project

**Part IV** – Environmental Studies, Value Based Education, Non Major Elective, Skill Enhancement Courses, Foundation Course, Ability Enhancement Course and Internship

**Part V** – Extension Activity

**Curriculum Design & Credit Distribution for  
UG Programme in B.Sc Information Technology**

**First Year**

| Semester-1            |      |                 |                                        |              |                 |           |     |       |         |
|-----------------------|------|-----------------|----------------------------------------|--------------|-----------------|-----------|-----|-------|---------|
| Course Code           | Part | Course Category | Course Name                            | Hours / Week | Examination     |           |     |       | Credits |
|                       |      |                 |                                        |              | Duration in Hrs | Max Marks |     |       |         |
|                       |      |                 |                                        |              |                 | CIA       | ESE | Total |         |
| 26U1TL11              | I    | Language- I     | Tamil-I                                | 5            | 3               | 50        | 50  | 100   | 3       |
| 26U1HD11              | I    |                 | Hindi -I                               |              |                 |           |     |       |         |
| 26U1MY11              | I    |                 | Malayalam-I                            |              |                 |           |     |       |         |
| 26U1FR11              | I    |                 | French – I                             |              |                 |           |     |       |         |
| 26U2EN11              | II   | Language- II    | English-I                              | 5            | 3               | 50        | 50  | 100   | 3       |
| 26UCIT11              | III  | Core- I         | Programming in C                       | 4            | 3               | 50        | 50  | 100   | 4       |
| 26UCITP1              | III  | Core -II        | C Programming Lab                      | 6            | 3               | 50        | 50  | 100   | 4       |
| 26UEIT11/<br>26UEIT12 | III  | EC - I          | Numerical Methods/Discrete Mathematics | 4            | 3               | 50        | 50  | 100   | 3       |
| 26USITP1              | IV   | SEC - I         | Office Automation Lab                  | 2            | 3               | 50        | 50  | 100   | 2       |
| 26UFIT11              | IV   | FC              | Fundamentals of Computers              | 2            | 3               | 50        | 50  | 100   | 2       |
| 26UNIT11              | IV   | NME - I         | Basics of Web Development              | 2            | 3               | 50        | 50  | 100   | 2       |
| Total                 |      |                 |                                        | 30           |                 |           |     | 800   | 23      |

| Semester-2            |      |                 |                                           |              |                 |           |     |       |         |
|-----------------------|------|-----------------|-------------------------------------------|--------------|-----------------|-----------|-----|-------|---------|
| Course Code           | Part | Course Category | Course Name                               | Hours / Week | Examination     |           |     |       | Credits |
|                       |      |                 |                                           |              | Duration in Hrs | Max Marks |     |       |         |
|                       |      |                 |                                           |              |                 | CIA       | ESE | Total |         |
| 26U1TL21              | I    | Language-I      | Tamil-II                                  | 5            | 3               | 50        | 50  | 100   | 3       |
| 26U1HD21              | I    |                 | Hindi -II                                 |              |                 |           |     |       |         |
| 26U1MY21              | I    |                 | Malayalam-II                              |              |                 |           |     |       |         |
| 26U1FR21              | I    |                 | French – II                               |              |                 |           |     |       |         |
| 26U2EN21              | II   | Language-II     | English-II                                | 5            | 3               | 50        | 50  | 100   | 3       |
| 26UCIT21              | III  | Core-III        | Java Programming                          | 4            | 3               | 50        | 50  | 100   | 4       |
| 26UCITP2              | III  | Core -IV [Lab]  | Java Programming Lab                      | 6            | 3               | 50        | 50  | 100   | 4       |
| 26UEIT21/<br>26UEIT22 | III  | EC - II         | Optimization Techniques / Data Structures | 4            | 3               | 50        | 50  | 100   | 3       |
| 26USITP2              | IV   | SEC – II [Lab]  | PHP Scripting Practical                   | 2            | 3               | 50        | 50  | 100   | 2       |
| 26USIT21              | IV   | SEC - III       | Introduction to Internet                  | 2            | 3               | 50        | 50  | 100   | 2       |
| 26UNIT21              | IV   | NME - II        | Fundamentals of Multimedia                | 2            | 3               | 50        | 50  | 100   | 2       |
| Total                 |      |                 |                                           | 30           |                 |           |     | 800   | 23      |

## Second Year

| Semester-3            |      |                 |                                                    |              |                 |           |     |       |         |
|-----------------------|------|-----------------|----------------------------------------------------|--------------|-----------------|-----------|-----|-------|---------|
| Course Code           | Part | Course Category | Course Name                                        | Hours / Week | Examination     |           |     |       | Credits |
|                       |      |                 |                                                    |              | Duration in Hrs | Max Marks |     |       |         |
|                       |      |                 |                                                    |              |                 | CIA       | ESE | Total |         |
| 26U1TL31              | I    | Language-I      | Tamil-III                                          | 5            | 3               | 50        | 50  | 100   | 3       |
| 26U1HD31              | I    |                 | Hindi -III                                         |              |                 |           |     |       |         |
| 26U1MY31              | I    |                 | Malayalam- III                                     |              |                 |           |     |       |         |
| 26U1FR31              | I    |                 | French - III                                       |              |                 |           |     |       |         |
| 26U2EN31              | II   | Language-II     | English-III                                        | 5            | 3               | 50        | 50  | 100   | 3       |
| 26UCIT31              | III  | Core-V          | Python Programming                                 | 4            | 3               | 50        | 50  | 100   | 4       |
| 26UCITP3              | III  | Core -VI [Lab]  | Python Programming- Lab                            | 6            | 3               | 50        | 50  | 100   | 4       |
| 26UEIT31/<br>26UEIT32 | III  | EC - III        | Digital Logic Fundamentals / Computer Architecture | 4            | 3               | 50        | 50  | 100   | 3       |
| 26USITP3              | IV   | SEC – IV [Lab]  | HTML &Web Designing-Lab                            | 2            | 3               | 50        | 50  | 100   | 2       |
| 26USITP4              | IV   | SEC – V [Lab]   | Animation - Lab                                    | 2            | 3               | 50        | 50  | 100   | 2       |
| 26UEVS31              | IV   | Common          | Environmental Studies                              | 2            | 3               | 50        | 50  | 100   | 2       |
| Total                 |      |                 |                                                    | 30           |                 |           |     | 800   | 23      |

| Semester-4          |      |                 |                                                                      |              |                 |           |     |       |         |
|---------------------|------|-----------------|----------------------------------------------------------------------|--------------|-----------------|-----------|-----|-------|---------|
| Course Code         | Part | Course category | Course Name                                                          | Hours / Week | Examination     |           |     |       | Credits |
|                     |      |                 |                                                                      |              | Duration in Hrs | Max Marks |     |       |         |
|                     |      |                 |                                                                      |              |                 | CIA       | ESE | Total |         |
| 26U1TL41            | I    | Language- I     | Tamil-IV                                                             | 5            | 3               | 50        | 50  | 100   | 3       |
| 26U1HD41            | I    |                 | Hindi -IV                                                            |              |                 |           |     |       |         |
| 26U1MY41            | I    |                 | Malayalam-IV                                                         |              |                 |           |     |       |         |
| 26U1FR41            | I    |                 | French – IV                                                          |              |                 |           |     |       |         |
| 26U2EN41            | II   | Language- II    | English-IV                                                           | 5            | 3               | 50        | 50  | 100   | 3       |
| 26UCIT41            | III  | Core- VII       | Operating System                                                     | 4            | 3               | 50        | 50  | 100   | 4       |
| 26UCITP4            | III  | Core –VIII      | Mobile Application Development- Lab                                  | 6            | 3               | 50        | 50  | 100   | 4       |
| 26UEIT41 / 26UEIT42 | III  | EC - IV         | Internet of Things and its Applications / Human Computer Interaction | 4            | 3               | 50        | 50  | 100   | 3       |
| 26USITP5            | III  | SEC –VI         | React –Lab                                                           | 2            | 3               | 50        | 50  | 100   | 2       |
| 26USITP6            | IV   | SEC - VII       | Advanced Excel - Lab                                                 | 2            | 3               | 50        | 50  | 100   | 2       |
| 26UVBE41            | V    | Common          | Value Based Education                                                | 2            | 3               | 50        | 50  | 100   | 2       |
| Total               |      |                 |                                                                      | 30           |                 |           |     | 800   | 23      |

### Third Year

| Semester-5          |      |                 |                                                                       |              |                  |           |     |       |         |
|---------------------|------|-----------------|-----------------------------------------------------------------------|--------------|------------------|-----------|-----|-------|---------|
| Course Code         | Part | Course Category | Course Name                                                           | Hours / Week | Examination      |           |     |       | Credits |
|                     |      |                 |                                                                       |              | Duration in Hrs. | Max Marks |     |       |         |
|                     |      |                 |                                                                       |              |                  | CIA       | ESE | Total |         |
| 26UCIT51            | III  | Core-IX         | Database Systems                                                      | 5            | 3                | 50        | 50  | 100   | 4       |
| 26UCIT52            | III  | Core - X        | Machine Learning                                                      | 5            | 3                | 50        | 50  | 100   | 4       |
| 26UCITP5            | III  | Core –XI [Lab]  | Database Systems-Lab                                                  | 5            | 3                | 50        | 50  | 100   | 4       |
| 26UCITP6            | III  | Core –XII [Lab] | Machine Learning-Lab                                                  | 5            | 3                | 50        | 50  | 100   | 4       |
| 26UEIT51 / 26UEIT52 | III  | EC-V            | Computer Networks / Data Mining                                       | 4            | 3                | 50        | 50  | 100   | 3       |
| 26UEIT53 26UEIT54   | III  | EC-VI           | Cryptography & Network Security / Artificial Intelligence             | 4            | 3                | 50        | 50  | 100   | 3       |
| 26UFIK51            | III  | Internship      | Internship/Industrial Visit /Field Visit/ Knowledge Updation Activity | -            | 3                | 50        | 50  | 100   | 2       |
| 26UAEC51            | IV   | AEC - I         | Empowered Vocational English                                          | 2            | 3                | 50        | 50  | 100   | 2       |
| Total               |      |                 |                                                                       | 30           |                  |           |     | 800   | 26      |

| Semester-6            |      |                    |                                            |              |                  |           |     |       |         |
|-----------------------|------|--------------------|--------------------------------------------|--------------|------------------|-----------|-----|-------|---------|
| Course Code           | Part | Course Category    | Course Name                                | Hours / Week | Examination      |           |     |       | Credits |
|                       |      |                    |                                            |              | Duration in Hrs. | Max Marks |     |       |         |
|                       |      |                    |                                            |              |                  | CIA       | ESE | Total |         |
| 26UCIT61              | III  | Core- XIII         | Software Engineering                       | 4            | 3                | 50        | 50  | 100   | 4       |
| 26UCIT62              | III  | Core -XIV          | Digital Image Processing                   | 4            | 3                | 50        | 50  | 100   | 4       |
| 26UCITP7              | III  | Core-XV [Lab]      | Image Processing using Scilab-Lab          | 6            | 3                | 50        | 50  | 100   | 4       |
| 26UCIT6P              | III  | Core-XVI [Project] | Project with Viva voce                     | 6            | 3                | 50        | 50  | 100   | 5       |
| 26UEIT61/<br>26UEIT62 | III  | EC- VII            | Trends in Computing/Big Data Analytics     | 4            | 3                | 50        | 50  | 100   | 3       |
| 26UEIT63<br>26UEIT64  | III  | EC-VIII            | Natural Language Processing/Cyber Security | 4            | 3                | 50        | 50  | 100   | 3       |
| 26UAEC61              | IV   | AEC-II             | Design Thinking                            | 2            | 3                | 50        | 50  | 100   | 2       |
| 26U5EA61              | V    | Common             | Extension Activity                         | -            |                  |           |     | 100   | 1       |
| Total                 |      |                    |                                            | 30           |                  |           |     | 800   | 26      |
| Grand Total           |      |                    |                                            | 180          |                  |           |     | 4800  | 144     |

**Internship (minimum of 30 hours):** The students should submit certificate of attendance from the industry stating the nature of work done, duration and role played along with report (minimum of 20 pages) at the end of V semester for external evaluation.

**Industrial Visit/ Field Visit:** A report based on the observation and learning outcome to be submitted (minimum of 10 pages) along with suitable evidences at the end of V semester for external evaluation.

**Knowledge Updation Activity :**A report to be submitted (minimum of 10 pages) based on the study made along with the completion certificate stating the work done (MOOC/NPTEL) at the end of V semester for external evaluation.

**Internship/Industrial Visit/Field Visit/Knowledge Updation Activity:** Internal –50 Marks, External – 50 Marks

**Project:** Group Project report should be submitted for external evaluation. Internal – 50 Marks, External – 50 Marks

**Extension Activity** (NSS/ NCC/ YRC/ RRC/ Games and Sports/ Youth Welfare Activities Outreach Programmes/Migration Awareness in the Tamil Nadu Education System): Individual report should be submitted at the end of VI semester for external evaluation.

External – 100 Marks

**Ability Enhancement Compulsory Course:** Empowered Vocational English and Design Thinking subjects is given to students.

Internal Marks – 50 Marks, External – 50 Marks

# Semester-I

## FIRST YEAR – SEMESTER – I

## CORE – I: PROGRAMMING IN C

| Subject Code        | L                                                                                                                                                                                                                                                                                                                                                                                 | T | P | Semester | Credits | Inst. Hours | Total Marks |              |       |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|--------------|-------|
|                     |                                                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             | CIA         | External     | Total |
| 26UCIT11            | 4                                                                                                                                                                                                                                                                                                                                                                                 | 0 | 0 | I        | 4       | 4           | 50          | 50           | 100   |
| Learning Objectives |                                                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             |             |              |       |
| LO1                 | To understand programming language concepts                                                                                                                                                                                                                                                                                                                                       |   |   |          |         |             |             |              |       |
| LO2                 | To write basic C programs                                                                                                                                                                                                                                                                                                                                                         |   |   |          |         |             |             |              |       |
| LO3                 | To use control structures and arrays                                                                                                                                                                                                                                                                                                                                              |   |   |          |         |             |             |              |       |
| LO4                 | To implement functions and structures                                                                                                                                                                                                                                                                                                                                             |   |   |          |         |             |             |              |       |
| LO5                 | To work with pointers and files                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             |             |              |       |
| Unit                | Contents                                                                                                                                                                                                                                                                                                                                                                          |   |   |          |         |             |             | No. of Hours |       |
| I                   | Studying Concepts of Programming Languages- Language Evaluation Criteria - Language design - Language Categories - Implementation Methods – Programming Environments - Overview of C: History of C- Importance of C- Basic Structure of C Programs- Executing a C Program- Constants, Variables and Data types - Operators and Expressions - Managing Input and Output Operations |   |   |          |         |             |             | 12           |       |
| II                  | Decision Making and Branching: Decision Making and Looping - Arrays - Character Arrays and Strings                                                                                                                                                                                                                                                                                |   |   |          |         |             |             | 12           |       |
| III                 | User Defined Functions: Elements of User Defined Functions- Definition of Functions- Return Values and their Types- Function Call- Function Declaration- Categories of Functions- Nesting of Functions-Recursion                                                                                                                                                                  |   |   |          |         |             |             | 12           |       |
| IV                  | Structures and Unions: Introduction- Defining a Structure- Declaring Structure Variables Accessing Structure Members- Structure Initialization- Arrays of Structures- Arrays within Structures- Unions- Size of Structures.                                                                                                                                                       |   |   |          |         |             |             | 12           |       |
| V                   | Pointers: Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables- Initializing of Pointer Variables- Accessing a Variable through its Pointer- Chain of Pointers- Pointer Expressions- Pointer and Scale Factor- Pointer                                                                                                                        |   |   |          |         |             |             | 12           |       |

|           |                                                                                                                                                                                |           |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|           | and Arrays- Pointers and Character Strings- Array of Pointers- Pointer as Function Arguments- Functions Returning Pointers- Pointers to Functions- <b>File Management in C</b> |           |
|           | <b>TOTAL HOURS</b>                                                                                                                                                             | <b>60</b> |
| <b>CO</b> | <b>Course Outcomes</b>                                                                                                                                                         |           |
| CO1       | Outline the fundamental concepts of C programming languages, and its features                                                                                                  |           |
| CO2       | Demonstrate the programming methodology.                                                                                                                                       |           |
| CO3       | Identify suitable programming constructs for problem solving.                                                                                                                  |           |
| CO4       | Select the appropriate data representation, control structures, functions and concepts based on the problem requirement.                                                       |           |
| CO5       | Evaluate the program performance by fixing the errors.                                                                                                                         |           |
|           | <b>Text Books</b>                                                                                                                                                              |           |
| 1         | Robert W. Sebesta, (2012), —Concepts of Programming Languages, Fourth Edition, Addison Wesley (Unit I : Chapter – 1)                                                           |           |
| 2         | E. Balaguruswamy, (2010), —Programming in ANSI C, Fifth Edition, Tata McGraw Hill Publications                                                                                 |           |
|           | <b>Reference Books</b>                                                                                                                                                         |           |
| 1         | Ashok Kamthane, (2009), —Programming with ANSI & Turbo C, Pearson Education                                                                                                    |           |
| 2         | Byron Gottfried, (2010), —Programming with C, Schaums Outline Series, Tata McGraw Hill Publications                                                                            |           |
|           | <b>Web Resources</b>                                                                                                                                                           |           |
| 1.        | <a href="http://www.tutorialspoint.com/cprogramming/">http://www.tutorialspoint.com/cprogramming/</a>                                                                          |           |
| 2.        | <a href="http://www.cprogramming.com/">http://www.cprogramming.com/</a>                                                                                                        |           |
| 3.        | <a href="http://www.programmingsimplified.com/c-program-examples">http://www.programmingsimplified.com/c-program-examples</a>                                                  |           |
| 4.        | <a href="http://www.programiz.com/c-programming">http://www.programiz.com/c-programming</a>                                                                                    |           |
| 5.        | <a href="http://www.cs.cf.ac.uk/Dave/C/CE.html">http://www.cs.cf.ac.uk/Dave/C/CE.html</a>                                                                                      |           |
| 6.        | <a href="http://fresh2refresh.com/c-programming/c-function/">http://fresh2refresh.com/c-programming/c-function/</a>                                                            |           |

**Mapping Table:**

| CO/PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
|--------|-------|-------|-------|-------|-------|-------|
| CO1    | 3     | 2     | 2     | 3     | 2     | 2     |
| CO2    | 3     | 3     | 2     | 3     | 2     | 2     |

|                                                        |           |           |           |           |           |           |
|--------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>CO3</b>                                             | <b>3</b>  | <b>3</b>  | <b>3</b>  | <b>3</b>  | <b>2</b>  | <b>2</b>  |
| <b>CO4</b>                                             | <b>3</b>  | <b>3</b>  | <b>2</b>  | <b>3</b>  | <b>2</b>  | <b>2</b>  |
| <b>CO5</b>                                             | <b>3</b>  | <b>3</b>  | <b>2</b>  | <b>3</b>  | <b>2</b>  | <b>2</b>  |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>15</b> | <b>14</b> | <b>11</b> | <b>15</b> | <b>10</b> | <b>10</b> |

**S-Strong-3**

**M-Medium-2**

**L-Low-1**

## CORE – II: C PROGRAMMING LAB

| Subject Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | L                                                                                       | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|-------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                         |   |   |          |         |             | CIA         | External | Total |
| 26UCITP1                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0                                                                                       | 0 | 6 | I        | 4       | 6           | 50          | 50       | 100   |
| Learning Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                         |   |   |          |         |             |             |          |       |
| LO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | The Course aims to provide exposure to problem-solving through C programming            |   |   |          |         |             |             |          |       |
| LO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To understand basic programming concepts using input/output and conditional statements. |   |   |          |         |             |             |          |       |
| LO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To develop programs using arrays, strings, and functions including recursion.           |   |   |          |         |             |             |          |       |
| LO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To learn memory management and pointers in programming.                                 |   |   |          |         |             |             |          |       |
| LO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To handle files and user-defined data types like structures, unions, typedef, and enum. |   |   |          |         |             |             |          |       |
| Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                         |   |   |          |         |             |             |          |       |
| 1. Programs using Input/Output functions<br>2. Programs on Conditional structures<br>3. Programs using Dynamic Memory Allocation (replaced Command Line Arguments)<br>4. Programs using Arrays<br>5. Programs using Multi-dimensional Arrays<br>6. String Manipulations<br>7. Programs using Functions<br>8. Recursive Functions<br>9. Programs using Pointers<br>10. Files<br>11. Programs using Structures & Unions<br>12. Programs using User-Defined Data Types (typedef & enum) |                                                                                         |   |   |          |         |             |             |          |       |
| TOTAL HOURS                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                         |   |   |          |         |             |             | 90       |       |
| CO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Course Outcomes                                                                         |   |   |          |         |             |             |          |       |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Demonstrate the understanding of syntax and semantics of C programs.                    |   |   |          |         |             |             |          |       |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Identify the problem and solve using C programming techniques.                          |   |   |          |         |             |             |          |       |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Identify suitable programming constructs for problem solving.                           |   |   |          |         |             |             |          |       |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Analyze various concepts of C language to solve the problem in an efficient way.        |   |   |          |         |             |             |          |       |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Develop a C program for a given problem and test for its correctness.                   |   |   |          |         |             |             |          |       |

**Mapping Table:**

| <b>CO/PSO</b>                                          | <b>PSO 1</b> | <b>PSO 2</b> | <b>PSO 3</b> | <b>PSO 4</b> | <b>PSO 5</b> | <b>PSO 6</b> |
|--------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>CO1</b>                                             | <b>3</b>     | <b>2</b>     | <b>2</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO2</b>                                             | <b>3</b>     | <b>3</b>     | <b>2</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO3</b>                                             | <b>3</b>     | <b>3</b>     | <b>3</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO4</b>                                             | <b>3</b>     | <b>3</b>     | <b>2</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO5</b>                                             | <b>3</b>     | <b>3</b>     | <b>2</b>     | <b>3</b>     | <b>3</b>     | <b>2</b>     |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>15</b>    | <b>14</b>    | <b>11</b>    | <b>15</b>    | <b>11</b>    | <b>10</b>    |

**S-Strong-3****M-Medium-2****L-Low-1**

## ELECTIVE COURSE– IA: NUMERICAL METHODS

| Subject Code        | L                                                                                                                                                                                                                                                                                                  | T | P | Semester | Credits | Inst. Hours | Total Marks |             |       |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|-------------|-------|
|                     |                                                                                                                                                                                                                                                                                                    |   |   |          |         |             | CIA         | External    | Total |
| 26UEIT11            | 4                                                                                                                                                                                                                                                                                                  | 0 | 0 | I        | 3       | 4           | 50          | 50          | 100   |
| Learning Objectives |                                                                                                                                                                                                                                                                                                    |   |   |          |         |             |             |             |       |
| LO1                 | To introduce the concept of solving equations using different methods.                                                                                                                                                                                                                             |   |   |          |         |             |             |             |       |
| LO2                 | To understand the use of Assignment and Transportation problems.                                                                                                                                                                                                                                   |   |   |          |         |             |             |             |       |
| LO3                 | To solve simultaneous linear equations using matrices.                                                                                                                                                                                                                                             |   |   |          |         |             |             |             |       |
| LO4                 | To apply numerical methods for differentiation and integration.                                                                                                                                                                                                                                    |   |   |          |         |             |             |             |       |
| LO5                 | To solve differential equations using numerical techniques.                                                                                                                                                                                                                                        |   |   |          |         |             |             |             |       |
| Unit                | Contents                                                                                                                                                                                                                                                                                           |   |   |          |         |             |             | No.of Hours |       |
| I                   | Curve Fitting: Introduction, Method of Least Squares, Curve Fitting, Fitting a Straight Line.                                                                                                                                                                                                      |   |   |          |         |             |             | 12          |       |
| II                  | Solution of Algebraic and Transcendental Equations: Bisection Method, Regula Falsi Method, Newton–Raphson Method.                                                                                                                                                                                  |   |   |          |         |             |             | 12          |       |
| III                 | Solution of Simultaneous Linear Equations: Introduction–.Notation & Definition – Types of Matrices- Operations on Matrices - Transpose of a matrix- Symmetric and Skew-symmetric Matrices - Complex Matrix Conjugate of a Matrix -Determinants of a Matrix – Inverse of a Matrix- Rank of a Matrix |   |   |          |         |             |             | 12          |       |
| IV                  | Numerical Differentiation and Integration:Newton’s Forward Difference, Newton’s Backward Difference, Newton’s Divided Difference (First Order Differentiation only). Integration using Trapezoidal Rule, Simpson’s 1/3 Rule and Simpson’s 3/8 Rule.                                                |   |   |          |         |             |             | 12          |       |
| V                   | Solution of Ordinary Differential Equations:Solution of Ordinary Differential Equations: Runge-Kutta 2nd Order and4th Order methods, Predictor-Corrector Methods: Euler’s Method- Picard’s Method                                                                                                  |   |   |          |         |             |             | 12          |       |
| TOTAL HOURS         |                                                                                                                                                                                                                                                                                                    |   |   |          |         |             |             | 60          |       |
| CO                  | Course Outcomes                                                                                                                                                                                                                                                                                    |   |   |          |         |             |             |             |       |
| CO1                 | Obtain numerical solutions of algebraic and transcendental equations.                                                                                                                                                                                                                              |   |   |          |         |             |             |             |       |

|                   |                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------|
| CO2               | Solve systems of linear equations numerically using direct and iterative methods.                                 |
| CO3               | Solve ordinary differential equations.                                                                            |
| CO4               | Compute integration using Simpson's Rule and the Trapezoidal Rule.                                                |
| CO5               | Apply numerical methods in real-life problems.                                                                    |
| <b>Text Books</b> |                                                                                                                   |
| 1.                | B. S. Grewal, <i>Numerical Methods in Engineering and Science</i> , Fifth Edition, Khanna Publishers, April 1999. |
| 2.                | M. K. Venkataraman, <i>Numerical Methods in Science and Engineering</i> , National Publishing Co., 2005.          |

**Mapping Table:**

| CO/PSO                                                 | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|--------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                    | 3         | 2         | 2         | 3         | 2         | 2         |
| CO2                                                    | 3         | 3         | 2         | 3         | 2         | 2         |
| CO3                                                    | 3         | 3         | 3         | 3         | 2         | 2         |
| CO4                                                    | 3         | 3         | 2         | 3         | 2         | 2         |
| CO5                                                    | 3         | 3         | 2         | 3         | 2         | 2         |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>15</b> | <b>14</b> | <b>11</b> | <b>15</b> | <b>10</b> | <b>10</b> |

**S-Strong-3**

**M-Medium-2**

**L-Low-1**

## ELECTIVE COURSE–IB: DISCRETE MATHEMATICS

| Subject Code        | L                                                                                                                                                                                                                                                                                        | T | P | Semester | Credits | Inst. Hours | Total Marks |             |       |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|-------------|-------|
|                     |                                                                                                                                                                                                                                                                                          |   |   |          |         |             | CIA         | External    | Total |
| 26UEIT12            | 4                                                                                                                                                                                                                                                                                        | 0 | 0 | I        | 3       | 4           | 50          | 50          | 100   |
| Learning Objectives |                                                                                                                                                                                                                                                                                          |   |   |          |         |             |             |             |       |
| LO1                 | To get knowledge about relations.                                                                                                                                                                                                                                                        |   |   |          |         |             |             |             |       |
| LO2                 | To understand functions and their classifications.                                                                                                                                                                                                                                       |   |   |          |         |             |             |             |       |
| LO3                 | To understand propositions and normal forms.                                                                                                                                                                                                                                             |   |   |          |         |             |             |             |       |
| LO4                 | To understand the usage of matrices                                                                                                                                                                                                                                                      |   |   |          |         |             |             |             |       |
| LO5                 | To acquire knowledge about graphs.                                                                                                                                                                                                                                                       |   |   |          |         |             |             |             |       |
| Unit                | Contents                                                                                                                                                                                                                                                                                 |   |   |          |         |             |             | No.of Hours |       |
| I                   | <b>Relations:</b> Introduction to Relations, Binary Relations, Classification of Relations, Composition of Relations, Inverse of Relation, Closure Operations on Relations, Matrix Representation of Relation, Digraphs.                                                                 |   |   |          |         |             |             | 12          |       |
| II                  | <b>Functions:</b> Introduction to Functions, Addition and Multiplication of Functions, Classification of Functions, Composition of Functions, Inverse Function.                                                                                                                          |   |   |          |         |             |             | 12          |       |
| III                 | <b>Propositions and Logic:</b> Introduction, Statements (Propositions), Laws of Formal Logic, Basic Set of Logical Operators/Operations, Propositions and Truth Tables, Algebra of Propositions, Tautologies and Contradictions, Logical Equivalence, Logical Implication, Normal Forms. |   |   |          |         |             |             | 12          |       |
| IV                  | <b>Matrices:</b> Introduction–.Notation & Definition – Types of Matrices- Operations on Matrices - Transpose of a matrix- Symmetric and Skew-symmetric Matrices - Complex Matrix Conjugate of a Matrix - Determinants of a Matrix – Inverse of a Matrix- Rank of a Matrix.               |   |   |          |         |             |             | 12          |       |
| V                   | <b>Graph Theory:</b> Introduction, Graph and Basic Terminologies, Types of Graphs, Subgraph and Isomorphic Graphs, Operations on Graphs, Representation of Graphs.                                                                                                                       |   |   |          |         |             |             | 12          |       |
| TOTAL HOURS         |                                                                                                                                                                                                                                                                                          |   |   |          |         |             | 60          |             |       |

| CO                     | Course Outcomes                                                                                                                  |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| CO1                    | To recall basic concepts for a clear understanding of mathematical principles.                                                   |
| CO2                    | To explain practical problems.                                                                                                   |
| CO3                    | To construct matrices using discrete mathematics.                                                                                |
| CO4                    | To analyze techniques to draw graphs using mathematics.                                                                          |
| CO5                    | To design graphs using appropriate representations.                                                                              |
| <b>Text Books</b>      |                                                                                                                                  |
| 1.                     | Swapan Kumar Chakraborty and Bikash Kanti Sarkar, <i>Discrete Mathematics</i> , Oxford University Press.                         |
| <b>Reference Books</b> |                                                                                                                                  |
| 1.                     | Seymour Lipschutz and Marc Lars Lipson, <i>Discrete Mathematics</i> , Third Edition, Tata McGraw Hill Education Private Limited. |
| 2.                     | J. P. Tremblay and R. Manohar, <i>Discrete Mathematical Structures with Applications to Computer Science</i> , TMH Edition.      |
| <b>Web Reference</b>   |                                                                                                                                  |
| 1.                     | <a href="https://www.tutorialspoint.com/discrete_mathematics">https://www.tutorialspoint.com/discrete_mathematics</a>            |

#### Mapping Table:

| CO/PSO                                             | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO 1                                               | 3         | 3         | 3         | 3         | 3         | 3         |
| CO2                                                | 3         | 3         | 3         | 3         | 3         | 3         |
| CO 3                                               | 3         | 3         | 3         | 3         | 3         | 3         |
| CO 4                                               | 3         | 3         | 3         | 3         | 2         | 3         |
| CO 5                                               | 3         | 3         | 2         | 3         | 3         | 2         |
| <b>Weightage of course contributed to each PSO</b> | <b>15</b> | <b>15</b> | <b>14</b> | <b>15</b> | <b>14</b> | <b>14</b> |

S-Strong-3

M-Medium-2

L-Low-1

## SKILL ENHANCEMENT COURSE I: OFFICE AUTOMATION LAB

| Subject Code       | L                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|-------|
|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |   |          |         |             | CIA         | External | Total |
| 26USIT11           | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0 | 2 | I        | 2       | 2           | 50          | 50       | 100   |
| Learning Objective |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |   |          |         |             |             |          |       |
| LO1                | Understand the basics of computer systems and their components.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |   |          |         |             |             |          |       |
| LO2                | Understand and apply the basic concepts of a word processing package.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |   |   |          |         |             |             |          |       |
| LO3                | Understand and apply the basic concepts of electronic spreadsheet software.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   |   |          |         |             |             |          |       |
| LO4                | Understand and apply the basic concepts of database management systems.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |   |   |          |         |             |             |          |       |
| LO5                | Understand and create a presentation using the PowerPoint tool.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |   |          |         |             |             |          |       |
|                    | <b>Exercises</b><br><b>MS–Word</b><br>1. Prepare a word document for spell checking and Thesaurus<br>2. Apply Cut, Copy, Paste, and Undo/Redo operations<br>3. Find a word and Replace with another in a document<br>4. Insert Header with College Name, Footer with Page No., and Footnote<br>5. Insert mathematical symbols using Microsoft Equation 3.0<br>6. Preparing Newsletter format (Apply Alignment, Font Property, Line spacing, Picture Format)<br>7. Prepare a Bio-Data and insert content of qualification within a table<br>8. Mail Merge with student/employee data<br>9. Create and use a Macro for repetitive formatting<br>10. Insert and format Smart Art / Shapes<br><b>MS–Excel</b><br>1. Apply formulas and functions<br>2. Prepare a chart for population growth<br>3. Create a Pivot Table with grouping<br>4. Apply ascending and descending order, and filter<br>5. Apply AutoFormat<br>6. Conditional Formatting to highlight marks/values<br>7. Data Validation (drop-down lists) |   |   |          |         |             |             |          |       |

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                      | <p style="text-align: center;"><b>MS–PowerPoint</b></p> <ol style="list-style-type: none"> <li>1. Create a PowerPoint presentation with 3 slides</li> <li>2. Create a design template with 3 slides</li> <li>3. Create a presentation with animation effects</li> <li>4. Create a presentation with 4 slides, set slide transition time of 3 seconds, and display</li> <li>5. Create a presentation using AutoContent Wizard</li> <li>6. Insert Audio/Video in a slide</li> <li>7. Use Slide Master for consistent formatting</li> </ol> <p style="text-align: center;"><b>MS–Access</b></p> <ol style="list-style-type: none"> <li>1. Create an Employee database</li> <li>2. Create a Student database and set primary key</li> <li>3. Prepare Salary list using queries</li> <li>4. Create a Report with grouping and summary</li> <li>5. Create Mailing Labels</li> <li>6. Create a query to filter students/employees by condition</li> <li>7. Use Form to enter data</li> </ol> |           |
|                      | <b>TOTAL HOURS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>30</b> |
| <b>Web Resources</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |
| 1.                   | <a href="https://www.udemy.com/course/office-automation-certificate-course/">https://www.udemy.com/course/office-automation-certificate-course/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |
| 2.                   | <a href="https://www.javatpoint.com/automation-tools">https://www.javatpoint.com/automation-tools</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |

**Mapping Table:**

| CO/PSO                                             | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO 1                                               | 3         | 3         | 3         | 3         | 3         | 3         |
| CO2                                                | 3         | 3         | 3         | 3         | 3         | 3         |
| CO 3                                               | 3         | 3         | 3         | 3         | 3         | 3         |
| CO 4                                               | 3         | 3         | 3         | 3         | 2         | 3         |
| CO 5                                               | 3         | 3         | 2         | 3         | 3         | 2         |
| <b>Weightage of course contributed to each PSO</b> | <b>15</b> | <b>15</b> | <b>14</b> | <b>15</b> | <b>14</b> | <b>14</b> |

**S-Strong-3**

**M-Medium-2**

**L-Low-1**

**FOUNDATION COURSE -I FUNDAMENTALS OF COMPUTERS**

| Subject Code        | L                                                                                                                                                                                                                              | T | P | Semester | Credits | Inst. Hours | Total Marks |          |              |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|--------------|
|                     |                                                                                                                                                                                                                                |   |   |          |         |             | CIA         | External | Total        |
| 26UFIT11            | 2                                                                                                                                                                                                                              | 0 | 0 | I        | 2       | 2           | 50          | 50       | 100          |
| Learning Objectives |                                                                                                                                                                                                                                |   |   |          |         |             |             |          |              |
| LO1                 | To analyze a problem with appropriate problem solving techniques                                                                                                                                                               |   |   |          |         |             |             |          |              |
| LO2                 | To understand the main principles of imperative, functional and logic oriented programming languages and                                                                                                                       |   |   |          |         |             |             |          |              |
| LO3                 | To increase the ability to learn new programming languages.                                                                                                                                                                    |   |   |          |         |             |             |          |              |
| LO4                 | To develop algorithms, flowcharts, and pseudo code for solving computational problems.                                                                                                                                         |   |   |          |         |             |             |          |              |
| LO5                 | To implement programming structures including modules, decision-making, and looping in problem solving.                                                                                                                        |   |   |          |         |             |             |          |              |
| Unit                | Contents                                                                                                                                                                                                                       |   |   |          |         |             |             |          | No. of Hours |
| I                   | Introduction: Characteristics of Computers - Evolution of Computers<br>Basic Computer Organization: I/O Unit - Storage Unit - Arithmetic Logic Unit - Control Unit - Central Processing Unit                                   |   |   |          |         |             |             |          | 6            |
| II                  | Number System: Decimal Number System- Binary Number System - Octal Number System - Hexadecimal Number System.<br>Binary Code: BCD- EBCDIC                                                                                      |   |   |          |         |             |             |          | 6            |
| III                 | Computer Software: Types of Software - System Architecture<br>Computer Languages: Machine Language - Assembly Language - High Level Language - Object Oriented Languages                                                       |   |   |          |         |             |             |          | 6            |
| IV                  | Problem Solving concepts for the computer: Constant Variables - Data Types - Functions -Operators - Expressions and Equations - Organizing the Solution: Analyzing the problem - Algorithm - Flowchart - Pseudo code           |   |   |          |         |             |             |          | 6            |
| V                   | Programming Structure: Structuring a solution - Modules and their function - Local and Global variables - Parameters - Return values - Sequential Logic Structure - Problem solving with Decision - Problem Solving with Loops |   |   |          |         |             |             |          | 6            |
| TOTAL HOURS         |                                                                                                                                                                                                                                |   |   |          |         |             |             | 30       |              |
| CO                  | Course Outcomes                                                                                                                                                                                                                |   |   |          |         |             |             |          |              |
| CO1                 | Outline the Computer fundamentals and various problem solving concepts in Computers.                                                                                                                                           |   |   |          |         |             |             |          |              |

|                        |                                                                                                                                                                                                 |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO2                    | Describe the basic computer organization, software, computer languages, software development life cycle and the need of structured programming in solving a computer problem                    |
| CO3                    | Identify the types of computer languages, software, computer problems and examine how to set up expressions and equations to solve the problem.                                                 |
| CO4                    | Choose most appropriate programming languages, constructs and features to solve the problems in diversified domains.                                                                            |
| CO5                    | Analyze the design of modules and functions in structuring the solution and various Organizing tools in problem solving.                                                                        |
| <b>Text Books</b>      |                                                                                                                                                                                                 |
| 1.                     | Pradeep K.Sinha and Priti Sinha, (2004) —Computer Fundamentals, Sixth Edition, BPB Publications. (Unit I : Chapter 1 & 2, Unit II : Chapter 10 & 12)                                            |
| 2.                     | Maureen Sprankle and Jim Hubbard, (2009) —Problem Solving and Programming Concept, Ninth Edition, Prentice Hall. (Unit III: Chapter 1,2 &3) Unit IV : Chapter 3, Unit V : Chapter 4,5 ,6,7 & 8) |
| <b>Reference Books</b> |                                                                                                                                                                                                 |
| 1.                     | R.G. Dromey, (2007), —How to Solve it by Computer, Prentice Hall International Series in Computer Science.                                                                                      |
| 2.                     | C. S. V. Murthy, (2009), —Fundamentals of Computers, Third Edition, Himalaya Publishing House.                                                                                                  |
| <b>Web Resources</b>   |                                                                                                                                                                                                 |
| 1.                     | <a href="http://www.tutorialspoint.com/computer_fundamentals/">http://www.tutorialspoint.com/computer_fundamentals/</a>                                                                         |
| 2.                     | <a href="http://www.comptechdoc.org/basic/basicut/">http://www.comptechdoc.org/basic/basicut/</a>                                                                                               |

| CO/PSO                                             | PSO 1     | PSO 2     | PSO 3     | PSO 4     | PSO 5     | PSO 6     |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                | 3         | 2         | 2         | 2         | 2         | 3         |
| CO2                                                | 3         | 2         | 2         | 2         | 3         | 2         |
| CO3                                                | 3         | 3         | 3         | 3         | 2         | 2         |
| CO4                                                | 3         | 2         | 2         | 2         | 2         | 3         |
| CO5                                                | 3         | 3         | 2         | 2         | 3         | 2         |
| <b>Weightage of course contributed to each PSO</b> | <b>15</b> | <b>12</b> | <b>11</b> | <b>11</b> | <b>12</b> | <b>12</b> |

**S-Strong-3    M-Medium-2    L-Low-1**

## NON MAJOR ELECTIVE COURSE I: BASICS OF WEB DEVELOPMENT

| Subject Code        | L                                                                                                                                                                     | T | P | Semester | Credits | Inst. Hours | Total Marks |               |       |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|---------------|-------|
|                     |                                                                                                                                                                       |   |   |          |         |             | CIA         | External      | Total |
| 26UNIT11            | 2                                                                                                                                                                     | - | - | I        | 2       | 2           | 50          | 50            | 100   |
| Learning Objectives |                                                                                                                                                                       |   |   |          |         |             |             |               |       |
| LO1                 | To insert a graphic within a web page.                                                                                                                                |   |   |          |         |             |             |               |       |
| LO2                 | To create a link within a web page.                                                                                                                                   |   |   |          |         |             |             |               |       |
| LO3                 | To create a table within a web page.                                                                                                                                  |   |   |          |         |             |             |               |       |
| LO4                 | To insert heading levels within a web page.                                                                                                                           |   |   |          |         |             |             |               |       |
| LO5                 | To insert ordered and unordered lists within a web page. Create a web page.                                                                                           |   |   |          |         |             |             |               |       |
| UNIT                | Contents                                                                                                                                                              |   |   |          |         |             |             | No. of. Hours |       |
| I                   | Introduction :Web Basics: What is Internet–Web browsers–What is Webpage –HTML Basics: Understanding tags.                                                             |   |   |          |         |             |             | 6             |       |
| II                  | TagsforDocumentstructure(HTML,Head,BodyTag).Blockleveltextele<br>ments:Headingsparagraph(<p> tag)–<br>Fontstyleelements:bold,italic,font,small,strong,strike,bigtags. |   |   |          |         |             |             | 6             |       |
| III                 | Lists: Types of lists: Ordered, Unordered– Nesting.                                                                                                                   |   |   |          |         |             |             | 6             |       |
| IV                  | Marquee, HR,BR-Using Images –Creating Hyperlinks.                                                                                                                     |   |   |          |         |             |             | 6             |       |
| V                   | Tables: Creating basic Table, Table elements, Caption–Table and cell<br>alignment–Rowspan, Colspan–Cellpadding.                                                       |   |   |          |         |             |             | 6             |       |
| TOTAL HOURS         |                                                                                                                                                                       |   |   |          |         |             | 30          |               |       |
| Course Outcomes     |                                                                                                                                                                       |   |   |          |         |             |             |               |       |
| CO                  | On completion of this course, students will                                                                                                                           |   |   |          |         |             |             |               |       |
| CO1                 | Knows the basic concept in HTML                                                                                                                                       |   |   |          |         |             |             |               |       |
| CO2                 | Concept of Meta Data                                                                                                                                                  |   |   |          |         |             |             |               |       |
| CO3                 | Understand the page formatting.                                                                                                                                       |   |   |          |         |             |             |               |       |
| CO4                 | Creating Links. Know the concept of creating link to email address                                                                                                    |   |   |          |         |             |             |               |       |
| CO5                 | Concept of adding images. Understand the table creation.                                                                                                              |   |   |          |         |             |             |               |       |
| Text Books          |                                                                                                                                                                       |   |   |          |         |             |             |               |       |
| 1.                  | “Mastering HTML5 and CSS3 Made Easy”, Teach U Comp Inc., 2014.                                                                                                        |   |   |          |         |             |             |               |       |

|                      |                                                                                                                                                                     |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.                   | Thomas Michaud, “Foundations of Web Design: Introduction to HTML & CSS”                                                                                             |
| <b>Web Resources</b> |                                                                                                                                                                     |
| 1.                   | <a href="https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf">https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf</a> |
| 2.                   | <a href="https://www.w3schools.com/html/default.asp">https://www.w3schools.com/html/default.asp</a>                                                                 |

**Mapping Table:**

| CO/PSO                                                 | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
|--------------------------------------------------------|-------|-------|-------|-------|-------|-------|
| CO 1                                                   | 3     | 3     | 3     | 3     | 3     | 3     |
| CO 2                                                   | 3     | 3     | 2     | 3     | 3     | 3     |
| CO 3                                                   | 2     | 3     | 3     | 3     | 3     | 3     |
| CO 4                                                   | 3     | 3     | 3     | 3     | 3     | 3     |
| CO 5                                                   | 3     | 3     | 3     | 2     | 3     | 3     |
| <b>Weightage of course<br/>contributed to each PSO</b> | 14    | 15    | 14    | 14    | 15    | 15    |

**S-Strong-3    M-Medium-2    L-Low-1**

# Semester-II

## FIRST YEAR – SEMESTER – II

## CORE – III: JAVAPROGRAMMING

| Subject Code        | L                                                                                                                                                                                                                                                                                                                                                        | T | P | Semester | Credits | Inst. Hours | Total Marks |          |              |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|--------------|
|                     |                                                                                                                                                                                                                                                                                                                                                          |   |   |          |         |             | CIA         | External | Total        |
| 26UCIT21            | 4                                                                                                                                                                                                                                                                                                                                                        | 0 | 0 | II       | 4       | 4           | 50          | 50       | 100          |
| Learning Objectives |                                                                                                                                                                                                                                                                                                                                                          |   |   |          |         |             |             |          |              |
| LO1                 | To understand the fundamentals of object-oriented programming and Java features                                                                                                                                                                                                                                                                          |   |   |          |         |             |             |          |              |
| LO2                 | To apply Java programming concepts such as variables                                                                                                                                                                                                                                                                                                     |   |   |          |         |             |             |          |              |
| LO3                 | To develop classes and objects using constructors                                                                                                                                                                                                                                                                                                        |   |   |          |         |             |             |          |              |
| LO4                 | To implement advanced OOP concepts including interfaces                                                                                                                                                                                                                                                                                                  |   |   |          |         |             |             |          |              |
| LO5                 | To understand and use Java application frameworks such as layout managers                                                                                                                                                                                                                                                                                |   |   |          |         |             |             |          |              |
| Unit                | Contents                                                                                                                                                                                                                                                                                                                                                 |   |   |          |         |             |             |          | No. of Hours |
| I                   | Fundamentals of Object-Oriented Programming:<br>Introduction – Object Oriented Paradigm – Concepts of Object-Oriented Programming – Benefits of OOP – Evolution – Java History – Java Features – Differs from C and C++ – Overview of Java Language – Java Program Structure – Tokens – Java Statements – Java Virtual Machine – Command Line Arguments. |   |   |          |         |             |             |          | 12           |
| II                  | Constants, Variables and Data Types – Operators and Expressions – Decision Making and Branching – Looping – Arrays – Strings – Collection – Interfaces and Classes.                                                                                                                                                                                      |   |   |          |         |             |             |          | 12           |
| III                 | Classes, Objects and Methods: Introduction – Defining a Class – Method Declaration – Constructors – Method Overloading – Static Members – Nesting of Methods – Inheritance – Overriding – Final Variables and Methods – Abstract Methods and Classes.                                                                                                    |   |   |          |         |             |             |          | 12           |
| IV                  | Multiple Inheritance: Defining Interfaces – Extending Interfaces – Implementing Interfaces – Packages: Creating Packages – Accessing Packages – Using a Package –Managing Errors and Exceptions – Multithreaded Programming.                                                                                                                             |   |   |          |         |             |             |          | 12           |
| V                   | Layout Managers – JDBC – Java Servlets: API, Life Cycle, HTTP Support, HTML Communication.                                                                                                                                                                                                                                                               |   |   |          |         |             |             |          | 12           |
| TOTAL HOURS         |                                                                                                                                                                                                                                                                                                                                                          |   |   |          |         |             |             | 60       |              |

| CO                     | Course Outcomes                                                                                                                                                                                        |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1                    | Outline the basic terminologies of OOP, programming language techniques, JDBC and Internet programming concepts                                                                                        |
| CO2                    | Solve problems using basic constructs, mechanisms, techniques and technologies of Java                                                                                                                 |
| CO3                    | Analyse and explain the behavior of simple programs involving different techniques such as Inheritance ,Packages ,Interfaces, Exception Handling and Thread and technologies such as JDBC and Servlets |
| CO4                    | Assess various problem-solving strategies involved in Java to develop a high-level application.                                                                                                        |
| CO5                    | Design GUI based JDBC applications and able to develop Servlets using suitable OOP concepts and techniques                                                                                             |
| <b>Text Books</b>      |                                                                                                                                                                                                        |
| 1.                     | E Balagurusamy (2010), “Programming with Java”, Tata Mc Graw Hill Edition India Private Ltd, 4th Edition                                                                                               |
| 2.                     | C Xavier, ”Java Programming – A Practical Approach”, Tata McGraw Hill Edition Private Ltd                                                                                                              |
| <b>Reference Books</b> |                                                                                                                                                                                                        |
| 1.                     | P.Naughton andH.Schildt (1999), “Java2 TheComplete Reference”, TMH, 3rdEdition                                                                                                                         |
| 2.                     | Jaison Hunder &WilliamCrawford(2002),”JavaServlet Programming”,O'Reilly                                                                                                                                |
| 3.                     | Jim Keogh (2002), “J2EE: TheComplete Reference”, Tata McGraw HillEdition.                                                                                                                              |
| <b>Web Resources</b>   |                                                                                                                                                                                                        |
| 1.                     | <a href="http://javabeginnerstutorial.com/core-java/">http://javabeginnerstutorial.com/core-java/</a>                                                                                                  |
| 2.                     | <a href="http://www.tutorialspoint.com/java/">http://www.tutorialspoint.com/java/</a>                                                                                                                  |
| 3.                     | <a href="http://beginnersbook.com/java-tutorial-for-beginners-with-examples/">http://beginnersbook.com/java-tutorial-for-beginners-with-examples/</a>                                                  |
| 4.                     | <a href="http://www.homeandlearn.co.uk/java/java.html">http://www.homeandlearn.co.uk/java/java.html</a>                                                                                                |

|    |                                                                                                                                             |
|----|---------------------------------------------------------------------------------------------------------------------------------------------|
| 5. | <a href="http://www.journaldev.com/1877/servlet-tutorial-java">http://www.journaldev.com/1877/servlet-tutorial-java</a> (Unit V:ServletAPI) |
|----|---------------------------------------------------------------------------------------------------------------------------------------------|

**Mapping Table:**

| CO/PSO                                                 | PSO 1     | PSO 2     | PSO 3     | PSO 4     | PSO 5     | PSO 6     |
|--------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                    | 3         | 2         | 2         | 2         | 2         | 2         |
| CO2                                                    | 2         | 3         | 2         | 2         | 2         | 2         |
| CO3                                                    | 2         | 3         | 3         | 3         | 2         | 2         |
| CO4                                                    | 2         | 3         | 2         | 2         | 2         | 2         |
| CO5                                                    | 3         | 3         | 2         | 2         | 2         | 2         |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>12</b> | <b>14</b> | <b>11</b> | <b>11</b> | <b>10</b> | <b>10</b> |

**S-Strong-3    M-Medium-2    L-Low-1**

## CORE – IV: JAVA PROGRAMMING LAB

| Subject Code                                                                                                                                                                                                                                                | L                                                                                                            | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|-------|
|                                                                                                                                                                                                                                                             |                                                                                                              |   |   |          |         |             | CIA         | External | Total |
| 26UCITP2                                                                                                                                                                                                                                                    | 0                                                                                                            | 0 | 6 | II       | 4       | 6           | 50          | 50       | 100   |
| Learning Objectives                                                                                                                                                                                                                                         |                                                                                                              |   |   |          |         |             |             |          |       |
| LO1                                                                                                                                                                                                                                                         | To design and develop applications using different Java programming language techniques, JDBC & Servlets     |   |   |          |         |             |             |          |       |
| LO2                                                                                                                                                                                                                                                         | To organize and manipulate the data with the help of fundamental data structures                             |   |   |          |         |             |             |          |       |
| LO3                                                                                                                                                                                                                                                         | To understand basic Java programming concepts and develop simple programs.                                   |   |   |          |         |             |             |          |       |
| LO4                                                                                                                                                                                                                                                         | To apply arrays, strings, and collection classes such as ArrayList, HashSet, and Vector in programming.      |   |   |          |         |             |             |          |       |
| LO5                                                                                                                                                                                                                                                         | To develop programs using classes, objects, inheritance, and interfaces.                                     |   |   |          |         |             |             |          |       |
| Contents                                                                                                                                                                                                                                                    |                                                                                                              |   |   |          |         |             |             |          |       |
| 1. Basic Programs<br>2. Arrays<br>3. Strings<br>4. Collection Classes (ArrayList, HashSet, Vector)<br>5. Classes and Objects<br>6. Interfaces<br>7. Inheritance<br>8. Packages<br>9. Exception Handling<br>10. Threads<br>11. Web Application using Servlet |                                                                                                              |   |   |          |         |             |             |          |       |
| TOTAL HOURS                                                                                                                                                                                                                                                 |                                                                                                              |   |   |          |         |             |             | 90       |       |
| CO                                                                                                                                                                                                                                                          | Course Outcomes                                                                                              |   |   |          |         |             |             |          |       |
| CO1                                                                                                                                                                                                                                                         | Identify and explain the way of solving the simple problems                                                  |   |   |          |         |             |             |          |       |
| CO2                                                                                                                                                                                                                                                         | Use appropriate software development environment to write, compile and execute object-oriented Java programs |   |   |          |         |             |             |          |       |
| CO3                                                                                                                                                                                                                                                         | Analyze and identify necessary mechanisms of Java needed to solve real-world problem                         |   |   |          |         |             |             |          |       |

|     |                                                                                                                          |
|-----|--------------------------------------------------------------------------------------------------------------------------|
| CO4 | Test for defects and validate a Java program with different inputs                                                       |
| CO5 | Design, develop and compile Core Java , GUI , JDBC and servlet applications that utilize OOP and data structure concepts |

| CO/ PSO                                                | PSO 1     | PSO 2     | PSO 3     | PSO 4     | PSO 5     | PSO 6     |
|--------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                    | 3         | 2         | 3         | 3         | 2         | 2         |
| CO2                                                    | 3         | 3         | 3         | 3         | 2         | 2         |
| CO3                                                    | 3         | 3         | 3         | 2         | 2         | 3         |
| CO4                                                    | 3         | 3         | 3         | 3         | 3         | 2         |
| CO5                                                    | 3         | 3         | 2         | 3         | 2         | 2         |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>15</b> | <b>14</b> | <b>14</b> | <b>14</b> | <b>11</b> | <b>11</b> |

**S-Strong-3    M-Medium-2   L-Low-1**

## ELECTIVE COURSE–IIA: OPTIMIZATION TECHNIQUES

| Subject Code        | L                                                                                                                                                                                                                                                 | T | P | Semester | Credits | Inst. Hours | Marks |          |             |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------|----------|-------------|
|                     |                                                                                                                                                                                                                                                   |   |   |          |         |             | CIA   | External | Total       |
| 26UEIT21            | 4                                                                                                                                                                                                                                                 | 0 | 0 | II       | 3       | 4           | 50    | 50       | 100         |
| Learning Objectives |                                                                                                                                                                                                                                                   |   |   |          |         |             |       |          |             |
| LO1                 | To apply various optimization techniques for decision making.                                                                                                                                                                                     |   |   |          |         |             |       |          |             |
| LO2                 | To introduce the use of variables for formulating complex mathematical models in management, science, and industrial applications.                                                                                                                |   |   |          |         |             |       |          |             |
| LO3                 | To solve assignment problems using the Hungarian method, including unbalanced cases.                                                                                                                                                              |   |   |          |         |             |       |          |             |
| LO4                 | To apply transportation models to find initial and optimal solutions for real-world problems.                                                                                                                                                     |   |   |          |         |             |       |          |             |
| LO5                 | To analyze project scheduling techniques using PERT and CPM methods.                                                                                                                                                                              |   |   |          |         |             |       |          |             |
| Unit                | Contents                                                                                                                                                                                                                                          |   |   |          |         |             |       |          | No.of Hours |
| I                   | <b>Introduction to Linear Programming Problem:</b> The Nature and Meaning of Operations Research (OR), Management Applications of OR, Modelling in OR, General Methods for Solving OR Models, Scope of OR.                                        |   |   |          |         |             |       |          | 12          |
| II                  | <b>Linear Programming Problem:</b> Formulation of LP problems – Graphical solution of LP problems –General formulation of LPP Slack and Surplus variables–Standard form of LPP Some important forms of LPP – Simplex Method I.                    |   |   |          |         |             |       |          | 12          |
| III                 | <b>Assignment Problems:</b> Mathematical Formulation of Assignment Problems, Hungarian Method, Unbalanced Assignment Problems, Various Types of Assignment Problems.                                                                              |   |   |          |         |             |       |          | 12          |
| IV                  | <b>Transportation Problems:</b> Transportation Model, Mathematical Formulation, Matrix Form, Methods for Finding Initial Basic Feasible Solution and Optimal Solution, Degeneracy in Transportation Problems, Unbalanced Transportation Problems. |   |   |          |         |             |       |          | 12          |
| V                   | <b>PERT and CPM Techniques:</b> Basic Steps, Network Diagram Representation, Rules for Drawing Network Diagrams, Labeling using Fulkerson's I–J Rule, Time Estimates and Critical Path in Network                                                 |   |   |          |         |             |       |          | 12          |

|  |                                                                                           |  |
|--|-------------------------------------------------------------------------------------------|--|
|  | Analysis. Network Analysis, Examples on Optimum Duration and Minimum Duration Cost, PERT. |  |
|--|-------------------------------------------------------------------------------------------|--|

| TOTAL HOURS     |                                                                                                                             | 60 |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------|----|
| CO              | Course Outcomes                                                                                                             |    |
| CO1             | Formulate and solve Linear Programming Problems.                                                                            |    |
| CO2             | Analyze the usage of Sequencing Problems.                                                                                   |    |
| CO3             | Applying Transportation Problem                                                                                             |    |
| CO4             | Evaluate Queuing Models.                                                                                                    |    |
| CO5             | Apply PERT and CPM techniques to find the optimal solution.                                                                 |    |
| Text Books      |                                                                                                                             |    |
| 1.              | S.D.Sharma,—OperationsResearchII,TenthEdition,Pearson,2017                                                                  |    |
| Reference Books |                                                                                                                             |    |
| 1.              | HamdyATaha,—Operations Research,NinthEdition,2016                                                                           |    |
| 2.              | V.Sundaresan, K.S.Ganapathy Subramanian, K.Ganesan, —Resource Management TechniquesII, Ninth Edition, A.R.Publications,2015 |    |

#### Mapping Table:

| CO/PSO                                      | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---------------------------------------------|------|------|------|------|------|------|
| CO 1                                        | 3    | 3    | 3    | 3    | 3    | 3    |
| CO2                                         | 3    | 3    | 3    | 3    | 3    | 3    |
| CO 3                                        | 3    | 3    | 3    | 3    | 3    | 3    |
| CO 4                                        | 3    | 3    | 3    | 3    | 2    | 3    |
| CO 5                                        | 3    | 3    | 2    | 3    | 3    | 2    |
| Weightage of course contributed to each PSO | 15   | 15   | 14   | 15   | 14   | 14   |

S-Strong-3 M-Medium-2 L-Low-1

## ELECTIVE COURSE IIB: DATA STRUCTURES

| Subject Code               | L | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|----------------------------|---|---|---|----------|---------|-------------|-------------|----------|-------|
|                            |   |   |   |          |         |             | CIA         | External | Total |
| 26UEIT22                   | 4 | 0 | 0 | II       | 3       | 4           | 50          | 50       | 100   |
| <b>Learning Objectives</b> |   |   |   |          |         |             |             |          |       |

|             |                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |  |  |  |  |                    |  |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--------------------|--|
| <b>LO1</b>  | To become familiar with various data structures and their applications.                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |                    |  |
| <b>LO2</b>  | To increase understanding of the basic concepts in the design and use of algorithms.                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |                    |  |
| <b>LO3</b>  | To understand basic concepts of hashing and hash tables.                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |  |  |                    |  |
| <b>LO4</b>  | To learn different types of trees and their operations & Tree traversal methods.                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |                    |  |
| <b>LO5</b>  | To understand sorting and searching techniques also to learn graph concepts and their applications.                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |                    |  |
| <b>Unit</b> | <b>Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |  |  |  |  | <b>No.of Hours</b> |  |
| I           | <b>Introduction and Arrays:</b> Definitions, Concept of Data Structures, Overview of Data Structures, Implementation of Data Structures. Arrays: 1D Array, Memory Allocation of an Array, Operations on Arrays, Applications of Arrays, Multidimensional Arrays, 2D Array, Sparse Matrices, 3D and n-Dimensional Arrays- Pointer Arrays                                                                                 |  |  |  |  |  |  | 12                 |  |
| II          | <b>Linked Lists:</b> Definition, Single Linked List, Representation of a Linked List in Memory, Operations on a Single Linked List, Circular Linked List, Operations on a Double Linked List, Operations on Circular Double Linked List, Applications of Linked List, Sparse Matrix Manipulation, Polynomial Representation, Dynamic Storage Management, Memory Representation, Fixed Block and Variable Block Storage. |  |  |  |  |  |  | 12                 |  |
| III         | <b>Stacks and Queues:</b> Stacks: Definitions, Representation, Array Representation of Stacks, Linked List Representation of Stacks, Operations on Stacks, Applications of Stacks, Evaluation of Arithmetic Expressions, Implementation of Recursion, Factorial Calculation.<br><br>Queues: Definition, Representation of Queues using an Array,                                                                        |  |  |  |  |  |  | 12                 |  |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                    | Representation using a Linked List, Various Queue Structures, Circular Queue, Dequeue, Priority Queue.                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |
| IV                 | <b>Hash Tables and Trees:</b> Hash Tables, Hashing Techniques, Collision Resolution Techniques, Closed Hashing, Open Hashing. Trees: Definition, Representation of Binary Tree, Linear Representation, Linked Representation, Operations on Binary Trees (Insertion, Deletion), Traversals (Inorder, Preorder, Postorder), Merging Binary Trees, Types of Binary Trees, Expression Tree, Binary Search Tree, Heap Tree, Threaded Binary Tree.                                                                                                  | 12        |
| V                  | <b>Sort:</b> Sorting Techniques – Straight Insertion Sort – Straight Selection Sort –Bubble Sort –Quick Sort – Merge Sort. Searching – Linear Search Techniques – Linear Search with Array – Linear Search with Linked List – Binary Search. Graphs:Graph Terminology - Graph types – Representation of graphs – Operations of graphs – operations on linked list representations of graphs - operations on matrix representations of graphs-Application of Graph Structures-Shortest Path Problem- Topological sorting –Minimum spanning tree | 12        |
| <b>TOTAL HOURS</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>60</b> |
| <b>CO</b>          | <b>Course Outcomes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |
| CO1                | Outline the different fundamental concepts of data structures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |
| CO2                | Make use of different memory representations for data storage and apply various operations.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |
| CO3                | Construct algorithms for different data structure operations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |

|                        |                                                                                                      |
|------------------------|------------------------------------------------------------------------------------------------------|
| CO4                    | Analyze data structure applications.                                                                 |
| CO5                    | Discover suitable techniques to provide solutions for solving problems.                              |
| <b>Text Books</b>      |                                                                                                      |
| 1                      | Classic Data Structures - Debasis Samanta, PHI Learning Limited, New Delhi, 2009 2 <sup>nd</sup> Ed. |
| <b>Reference Books</b> |                                                                                                      |

|                      |                                                                                                                                                                                                                               |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                   | Seymour Lipschutz (1986), <i>Theory and Problems of Data Structures</i> , Tata McGraw Hill Ed                                                                                                                                 |
| 2.                   | E. Horowitz, S. Sahni, and S. Rajasekaran (1998), <i>Computer Algorithms</i> , Galgotia Publications.                                                                                                                         |
| 3.                   | Robert Kruse, C. L. Tondo, and Bruce Leung, <i>Data Structures and Program Design in C</i> , Second Edition, Prentice Hall Publications.                                                                                      |
| <b>Web Resources</b> |                                                                                                                                                                                                                               |
| 1.                   | <a href="http://www.cs.sunysb.edu/~skiena/214/lectures/">http://www.cs.sunysb.edu/~skiena/214/lectures/</a>                                                                                                                   |
| 2.                   | <a href="http://datastructures.itgo.com/graphs/dfsdfs.htm">http://datastructures.itgo.com/graphs/dfsdfs.htm</a>                                                                                                               |
| 3.                   | <a href="http://oopweb.com/Algorithms/Documents/PLDS210/VolumeFrames.html">http://oopweb.com/Algorithms/Documents/PLDS210/VolumeFrames.html</a>                                                                               |
| 4.                   | <a href="http://discuss.codechef.com/questions/48877/data-structures-and-algorithms">http://discuss.codechef.com/questions/48877/data-structures-and-algorithms</a>                                                           |
| 5.                   | <a href="http://code.tutsplus.com/tutorials/algorithms-and-data-structures--cms-20437">http://code.tutsplus.com/tutorials/algorithms-and-data-structures--cms-20437</a>                                                       |
| 6.                   | <a href="https://www.tutorialspoint.com/data_structures_algorithms/insertion_sort_algorithm.html">https://www.tutorialspoint.com/data_structures_algorithms/insertion_sort_algorithm.html</a><br>(Unit IV: Insertion Sorting) |

#### Mapping Table:

| CO/PSO                                                 | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|--------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                    | 3         | 2         | 2         | 3         | 3         | 3         |
| CO2                                                    | 3         | 3         | 2         | 3         | 3         | 3         |
| CO3                                                    | 3         | 3         | 3         | 3         | 3         | 2         |
| CO4                                                    | 3         | 3         | 2         | 3         | 3         | 3         |
| CO5                                                    | 3         | 3         | 2         | 3         | 3         | 2         |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>15</b> | <b>14</b> | <b>11</b> | <b>15</b> | <b>15</b> | <b>13</b> |

**S-Strong-3    M-Medium-2    L-Low-1**

## SKILL ENHANCEMENT COURSE II: PHP SCRIPTING PRACTICAL

| Subject Code | L | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|--------------|---|---|---|----------|---------|-------------|-------------|----------|-------|
|              |   |   |   |          |         |             | CIA         | External | Total |
| 26USITP2     | 0 | 0 | 2 | II       | 2       | 2           | 50          | 50       | 100   |

| Learning Objectives |                                                                                          |             |
|---------------------|------------------------------------------------------------------------------------------|-------------|
| LO1                 | To understand basic programming concepts like control structures, arrays, and functions. |             |
| LO2                 | To develop skills in handling forms and performing string manipulations.                 |             |
| LO3                 | To learn sorting techniques and basic problem-solving methods.                           |             |
| LO4                 | To understand object-oriented concepts such as classes and objects.                      |             |
| LO5                 | To work with databases, cookies, sessions, and basic graphics.                           |             |
| SNO                 | Contents                                                                                 | No.of Hours |
| 1                   | Exercises:<br>1. Control Structures<br>2. Working with Forms.                            | 5           |
| 2                   | 3. String Manipulations<br>4. Arrays<br>5. Functions<br>6. Sorting                       | 10          |
| 3                   | 7. Classes and Objects<br>8. Cookies and Sessions<br>9. Graphics                         | 10          |
| 4                   | 10. Working with single table<br>11. Working with multiple tables                        | 5           |
| <b>TOTAL HOURS</b>  |                                                                                          | <b>30</b>   |
| CO                  | Course Outcomes                                                                          |             |
| CO1                 | Demonstrate simple programs using PHP and jQuery.                                        |             |
| CO2                 | Apply interface setup, styles, and themes for the given application.                     |             |

|                        |                                                                                                                                    |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| CO3                    | Analyze the problem and add necessary user interface components, multimedia components, and web data sources into the application. |
| CO4                    | Evaluate the results by implementing the correct techniques on the web form.                                                       |
| CO5                    | Construct web applications using the facilitated components in PHP and jQuery.                                                     |
| <b>Text Books</b>      |                                                                                                                                    |
| 1.                     | Kevin Tatroe, Peter MacIntyre, and Rasmus Lerdorf, <i>Programming PHP</i> , Third Edition, O'Reilly Publications.                  |
| 2.                     | Joel Murach and Ray Harris (2010), <i>PHP and MySQL</i> , Shroff Publishers & Distributors.                                        |
| <b>Reference Books</b> |                                                                                                                                    |
| 1                      | W. Jason Gilmore (2010), <i>Beginning PHP and MySQL</i> , Apress.                                                                  |
| 2                      | Larry Ullman (2008), <i>PHP 6 and MySQL 5</i> , Pearson Education.                                                                 |

|                      |                                                                                                                                                           |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Web Resources</b> |                                                                                                                                                           |
| 1                    | <a href="http://www.w3schools.com/jquery/">http://www.w3schools.com/jquery/</a>                                                                           |
| 2                    | <a href="http://www.ccc.commnet.edu/faculty/sfreeman/cst%20250/jQueryNotes.pdf">http://www.ccc.commnet.edu/faculty/sfreeman/cst%20250/jQueryNotes.pdf</a> |
| 3                    | <a href="http://www.w3schools.com/php/">http://www.w3schools.com/php/</a>                                                                                 |
| 4                    | <a href="http://www.tutorialspoint.com/php/">http://www.tutorialspoint.com/php/</a>                                                                       |
| 5                    | <a href="http://www.tutorialspoint.com/mysql/">http://www.tutorialspoint.com/mysql/</a>                                                                   |

#### Mapping Table:

| CO/PSO                                             | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                | 3         | 2         | 2         | 3         | 3         | 2         |
| CO2                                                | 3         | 3         | 2         | 2         | 2         | 3         |
| CO3                                                | 3         | 2         | 3         | 2         | 2         | 3         |
| CO4                                                | 3         | 2         | 2         | 2         | 2         | 3         |
| CO5                                                | 3         | 2         | 2         | 3         | 2         | 2         |
| <b>Weightage of course contributed to each PSO</b> | <b>15</b> | <b>11</b> | <b>11</b> | <b>12</b> | <b>11</b> | <b>13</b> |

**S-Strong-3    M-Medium-2    L-Low-1**

### SKILL ENHANCEMENT COURSE III: INTRODUCTION TO INTERNET

| Subject Code               | L                                                          | T | P | Semester | Credits | Inst. Hours | Marks |          |       |
|----------------------------|------------------------------------------------------------|---|---|----------|---------|-------------|-------|----------|-------|
|                            |                                                            |   |   |          |         |             | CIA   | External | Total |
| 26USIT2<br>1               | 2                                                          | 0 | 0 | II       | 2       | 2           | 50    | 50       | 100   |
| <b>Learning Objectives</b> |                                                            |   |   |          |         |             |       |          |       |
| <b>LO1</b>                 | To acquire knowledge of the Internet and its applications. |   |   |          |         |             |       |          |       |
| <b>LO2</b>                 | To understand the format of the tags.                      |   |   |          |         |             |       |          |       |
| <b>LO3</b>                 | To understand the tags and HTML document creation.         |   |   |          |         |             |       |          |       |
| <b>LO4</b>                 | To understand table creation.                              |   |   |          |         |             |       |          |       |
| <b>LO5</b>                 | To get knowledge about forms.                              |   |   |          |         |             |       |          |       |

| UNIT NO            | Contents                                                                                                            | No. of Hours |
|--------------------|---------------------------------------------------------------------------------------------------------------------|--------------|
| I                  | <b>Introduction to the Internet:</b> Networking, Internet, Email, Resource Sharing, Gopher, World Wide Web.         | 6            |
| II                 | <b>Internet Technologies:</b> Browsers, Introduction to HTML, History of HTML, HTML Documents- Images and pictures. | 6            |
| III                | <b>HTML Structure and Lists:</b> Head and Body Sections, Designing the Body Section, Ordered and Unordered Lists.   | 6            |
| IV                 | <b>Tables and Styles:</b> Table Handling, DHTML and Style sheets- Responsive Tables with CSS and Media Queries      | 6            |
| V                  | <b>Frames and Forms:</b> Frames, Web Page Design Project, Forms.                                                    | 6            |
| <b>TOTAL HOURS</b> |                                                                                                                     | <b>30</b>    |
| <b>CO</b>          | <b>Course Outcomes</b>                                                                                              |              |
| CO1                | Explain the basic functions of HTML tags.                                                                           |              |
| CO2                | Create simple web pages using HTML.                                                                                 |              |
| CO3                | Describe the concepts of tables, frames, and forms.                                                                 |              |
| CO4                | Create web pages using tables, frames, and forms.                                                                   |              |

|                   |                                                                                                        |
|-------------------|--------------------------------------------------------------------------------------------------------|
| CO5               | Update knowledge to learn any future advanced version of the language.                                 |
| <b>Text Books</b> |                                                                                                        |
| 1.                | C. Xavier, <i>World Wide Web Design with HTML</i> , First Edition, Tata McGraw Hill Publication, 2000. |

**Mapping Table:**

| CO/PSO                                                 | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|--------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                    | 3         | 2         | 2         | 3         | 3         | 2         |
| CO2                                                    | 3         | 3         | 2         | 2         | 2         | 3         |
| CO3                                                    | 3         | 2         | 3         | 2         | 2         | 3         |
| CO4                                                    | 3         | 2         | 2         | 2         | 2         | 3         |
| CO5                                                    | 3         | 2         | 2         | 3         | 2         | 2         |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>15</b> | <b>11</b> | <b>11</b> | <b>12</b> | <b>11</b> | <b>13</b> |

**S-Strong-3    M-Medium-2    L-Low-1**

## NON MAJOR ELECTIVE COURSE II: FUNDAMENTALS OF MULTIMEDIA

| Subject Code       | L                                                                                                                                        | T | P | Semester | Credits | Inst. Hours | Total Marks |              |       |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|--------------|-------|
|                    |                                                                                                                                          |   |   |          |         |             | CIA         | External     | Total |
| 26UNIT21           | 2                                                                                                                                        | - | - | II       | 2       | 2           | 50          | 50           | 100   |
| Learning Objective |                                                                                                                                          |   |   |          |         |             |             |              |       |
| LO1                | To understand the basic concepts                                                                                                         |   |   |          |         |             |             |              |       |
| LO2                | To identify the role of text                                                                                                             |   |   |          |         |             |             |              |       |
| LO3                | To explain the fundamentals of audio                                                                                                     |   |   |          |         |             |             |              |       |
| LO4                | To describe video formats                                                                                                                |   |   |          |         |             |             |              |       |
| LO5                | To understand the stages of multimedia project development                                                                               |   |   |          |         |             |             |              |       |
| Unit               | Details                                                                                                                                  |   |   |          |         |             |             | No. of Hours |       |
| I                  | Basics of Multimedia: Definition of Multimedia-Uses of Multimedia - Delivering Multimedia - Components of Multimedia.                    |   |   |          |         |             |             | 6            |       |
| II                 | Text& Images : Fonts and Faces-Using Text in Multimedia - Font Editing and Design Tools. Images: Color Basics - Image File Formats.      |   |   |          |         |             |             | 6            |       |
| III                | Audio and Animation : Digital Audio and MIDI-Audio File Formats - Basics of Animation                                                    |   |   |          |         |             |             | 6            |       |
| IV                 | Video : Using Video - Digital Video Formats -Video Editing Basics                                                                        |   |   |          |         |             |             | 6            |       |
| V                  | Multimedia Project : Stages of Multimedia Project - Hardware and Software Needs - Planning and Costing -Acquiring Content and Teamwork.. |   |   |          |         |             |             | 6            |       |
|                    | TOTAL HOURS                                                                                                                              |   |   |          |         |             |             | 30           |       |
| Course Outcomes    |                                                                                                                                          |   |   |          |         |             |             |              |       |
| CO                 | On completion of this course, students will                                                                                              |   |   |          |         |             |             |              |       |
| CO1                | Define multimedia and explain its uses, delivery methods, and components.                                                                |   |   |          |         |             |             |              |       |
| CO2                | Apply text formatting, font selection, and image basics in multimedia projects.                                                          |   |   |          |         |             |             |              |       |

|                        |                                                                                                                                                                                                                               |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO3</b>             | Differentiate digital audio and MIDI, and use basic animation concepts.                                                                                                                                                       |
| <b>CO4</b>             | Analyze video formats and perform simple video editing tasks.                                                                                                                                                                 |
| <b>CO5</b>             | Plan and organize a basic multimedia project with proper resources and team coordination.                                                                                                                                     |
| <b>Text Book</b>       |                                                                                                                                                                                                                               |
| <b>1</b>               | TayVaughan,"Multimedia:MakingItWork",8 <sup>th</sup> Edition,Osborne/McGraw-Hill,2001.                                                                                                                                        |
| <b>Reference Books</b> |                                                                                                                                                                                                                               |
| <b>1.</b>              | <b>Ralf Steinmetz &amp; Klara Nahrstedt — <i>Multimedia: Computing, Communications &amp; Applications</i> Publisher: Pearson Education (2012 reprint of a classic multimedia reference) ISBN: 978-8177584417 / 8177584413</b> |
| <b>Web Resources</b>   |                                                                                                                                                                                                                               |
| <b>1.</b>              | <a href="https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/">https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/</a>                                           |

**Mapping Table:**

| <b>CO/PSO</b>                                      | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> |
|----------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                                         | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    |
| <b>CO2</b>                                         | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    |
| <b>CO3</b>                                         | <b>3</b>    | <b>2</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    |
| <b>CO4</b>                                         | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    |
| <b>CO5</b>                                         | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    |
| <b>Weightage of course contributed to each PSO</b> | <b>15</b>   | <b>11</b>   | <b>11</b>   | <b>12</b>   | <b>11</b>   | <b>13</b>   |

**S-Strong-3    M-Medium-2    L-Low-1**

# Semester-III

### **SECOND YEAR – SEMESTER – III**

# CORE-V PYTHON PROGRAMMING

| Subject Code        | L                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | T | P | Semester | Credits | Inst. Hours | Marks |              |       |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------|--------------|-------|
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   |   |          |         |             | CIA   | External     | Total |
| 26UCIT31            | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0 | 0 | III      | 4       | 4           | 50    | 50           | 100   |
| Learning Objectives |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   |   |          |         |             |       |              |       |
| LO1                 | To understand the basics of Python programming, including syntax, data types, and operators.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |   |          |         |             |       |              |       |
| LO2                 | To learn decision-making, looping, functions, and modules in Python.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |          |         |             |       |              |       |
| LO3                 | To work with strings, files, and built-in data structures like lists, tuples, sets, and dictionaries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |   |   |          |         |             |       |              |       |
| LO4                 | To understand object-oriented concepts such as classes, objects, inheritance, and operator overloading.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |   |          |         |             |       |              |       |
| LO5                 | To learn error and exception handling techniques for writing robust Python programs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |          |         |             |       |              |       |
| Unit                | Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |   |          |         |             |       | No. of Hours |       |
| I                   | <b>Basics of Python Programming:</b> Features of Python – Writing and Executing first Python Program – Literal Constants – Variables and Identifiers – Data types of Identifiers – Input Operation – Comments – Reserved Words – Indentation – Operators and Expressions – Expressions in Python – Operations on Strings – Other Data Types – Type Conversion. Decision Control Statements: Introduction – Selection/ Conditional Branching Statements – Basic Loop Structures – Nested Loops – The break statement – The continue statement – pass statement – The else statement used with loops |   |   |          |         |             |       | 12           |       |
| II                  | <b>Functions and Modules: Introduction</b> – Function Definition – Function Call – Variable Scope and Lifetime – The return statement – Fruitful functions – Lambda functions or Anonymous functions – Function composition in Python – Documentation strings – Good Programming Practices – Recursive functions – Modules – Packages in Python – Standard Library Modules – Function Redefinition. Python Strings: Introduction – Concatenating, Appending and Multiplying Strings – Strings are Immutable – String formatting operator – Built-in                                                |   |   |          |         |             |       | 12           |       |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                    | String methods and functions – Slice operation – Comparing strings – Iterating string – Regular Expressions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |           |
| III                | File Handling: Introduction – File Path – Types of Files – Opening and Closing Files – Reading and Writing files – File positions – Renaming and Deleting files – Directory methods. Data Structures: Sequence – Lists – Functional Programming – Tuple – 12 Page No. 29 Sets – Dictionaries                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12        |
| IV                 | <b>Classes and Objects: Introduction</b> – Classes and Objects – Class method and self argument – The <code>_int_()</code> Method (The class constructor) – Class variables and object variables – The <code>_del_()</code> method – Other special methods – Public and Private data members – Private methods – Method Invocation using self– Built-in functions to check, get, set and delete class attributes – Built-in class attributes – Garbage collection – Class methods – Static methods. Inheritance: Introduction – Inheriting classes in Python – Types of Inheritance –Single and Multiple Inheritance – Abstract classes and Interfaces – Metaclass.                                                                       | 12        |
| V                  | Operator Overloading: Introduction – Implementing operator overloading – Reverse adding – Overriding <code>_getitem_()</code> and <code>_setitem_()</code> methods – Overriding the in Operator – Overloading the Miscellaneous functions – Overriding the <code>_call_()</code> method. Error and Exception Handling: Introduction to Errors and Exceptions – Handling Exceptions – Multiple Except Blocks – Multiple Exceptions in a Single Block – Except Block without Exception – The else Clause – Raising Exceptions – Instantiating Exceptions – Handling Exceptions in Invoked functions – Built-in and User-defined Exceptions – The finally Block – Pre-defined clean-up action – Re-raising Exception – Assertions in Python. | 12        |
| <b>TOTAL HOURS</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>60</b> |
| <b>CO</b>          | <b>Course Outcomes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |
| CO1                | Outline the basic concepts in python language.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |
| CO2                | Interpret different looping and conditional statements in python language                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |

|                        |                                                                                                                                           |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| CO3                    | Apply the various data types and identify the usage of control statements, loops, functions and Modules in python for processing the data |
| CO4                    | Analyze and solve problems using basic constructs and techniques of python.                                                               |
| CO5                    | Assess the approaches used in the development of interactive application.                                                                 |
| <b>Textbooks</b>       |                                                                                                                                           |
| 1.                     | Reema Thareja, “Python Programming using problem solving approach”, First Edition, 2017, Oxford University Press.                         |
| 2.                     | Dr. R. Nageswara Rao, “Core Python Programming”, First Edition, 2017, Dream tech Publishers                                               |
| <b>Reference Books</b> |                                                                                                                                           |
| 1.                     | Vamsi Kurama, “Python Programming: A Modern Approach”, Pearson Education.                                                                 |
| 2.                     | Mark Lutz, ”Learning Python”, Orielly.                                                                                                    |
| <b>Web Resources</b>   |                                                                                                                                           |
| 1.                     | <a href="https://www.programiz.com/python-programming">https://www.programiz.com/python-programming</a>                                   |
| 2.                     | <a href="https://www.guru99.com/python-tutorials.html">https://www.guru99.com/python-tutorials.html</a>                                   |

| <b>Mapping Table:</b>                              |             |             |             |             |             |             |
|----------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO/PSO</b>                                      | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> |
| <b>CO1</b>                                         | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    |
| <b>CO2</b>                                         | <b>2</b>    | <b>3</b>    | <b>2</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    |
| <b>CO3</b>                                         | <b>2</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>1</b>    |
| <b>CO4</b>                                         | <b>1</b>    | <b>2</b>    | <b>2</b>    | <b>1</b>    | <b>3</b>    | <b>2</b>    |
| <b>CO5</b>                                         | <b>2</b>    | <b>2</b>    | <b>2</b>    | <b>1</b>    | <b>3</b>    | <b>3</b>    |
| <b>Weightage of course contributed to each PSO</b> | <b>10</b>   | <b>12</b>   | <b>10</b>   | <b>10</b>   | <b>13</b>   | <b>10</b>   |

**S-Strong-3    M-Medium-2                      L-Low-1**

# CORE VI: PYTHON PROGRAMMING-LAB

| Subject Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | L                                                                                                                          | T | P | Semester | Credits | Inst. Hours | Marks |          |       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------|----------|-------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                            |   |   |          |         |             | CIA   | External | Total |
| 26UCITP3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0                                                                                                                          | 0 | 6 | III      | 4       | 6           | 50    | 50       | 100   |
| Learning Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                            |   |   |          |         |             |       |          |       |
| LO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Understand the fundamentals of programming using Python, such as variables, data types, control structures, and functions. |   |   |          |         |             |       |          |       |
| LO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Learn how to use Python libraries and modules to solve problems.                                                           |   |   |          |         |             |       |          |       |
| LO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Practice writing Python code to solve real-world problems and build basic applications.                                    |   |   |          |         |             |       |          |       |
| LO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Gain experience with common programming paradigms, such as object-oriented programming and functional programming.         |   |   |          |         |             |       |          |       |
| LO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Understand best practices for debugging and testing code.                                                                  |   |   |          |         |             |       |          |       |
| List of Exercises                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                            |   |   |          |         |             |       |          |       |
| 1. Program using variables, constants, I/O statements in Python.<br>2. Program using Operators in Python.<br>3. Program using Conditional Statements.<br>4. Program using Loops.<br>5. Program using Jump Statements.<br>6. Program using Functions.<br>7. Program using Recursion.<br>8. Program using Arrays.<br>9. Program using Strings.<br>10. Program using Modules.<br>11. Program using Lists.<br>12. Program using Tuples.<br>13. Program using Linked List<br>14. Program using Stacks.<br>15. Program using Queue<br>16. Program using Sorting |                                                                                                                            |   |   |          |         |             |       |          |       |
| TOTAL HOURS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                            |   |   |          |         |             |       |          | 90    |

| <b>CO</b> | <b>Course Outcomes</b>                                                                              |
|-----------|-----------------------------------------------------------------------------------------------------|
| CO1       | Understand the significance of control statements, loops and functions in creating Simple programs. |
| CO2       | Interpret the core data structures available in python to store, process and sort the data.         |
| CO3       | Develop the real time applications using python programming language.                               |
| CO4       | Analyze the real time problem using suitable python concepts.                                       |
| CO5       | Assess the complex problems using appropriate concepts in python.                                   |

**Mapping Table:**

| <b>CO/PSO</b>                                          | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> |
|--------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| CO1                                                    | 3           | 2           | 3           | 2           | 3           | 3           |
| CO2                                                    | 3           | 3           | 2           | 2           | 3           | 3           |
| CO3                                                    | 3           | 2           | 2           | 3           | 3           | 2           |
| CO4                                                    | 3           | 2           | 3           | 3           | 2           | 2           |
| CO5                                                    | 3           | 3           | 3           | 3           | 3           | 2           |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>15</b>   | <b>12</b>   | <b>13</b>   | <b>13</b>   | <b>14</b>   | <b>12</b>   |

**S-Strong-3    M-Medium-2    L-Low-1**

**ELECTIVE COURSE III A : DIGITAL LOGIC FUNDAMENTALS**

| Subject Code | L                                                                                                                                                                                                                                                                                                                                               | T | P | Semester | Credits | Inst. Hours | Total Marks |              |       |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|--------------|-------|
|              |                                                                                                                                                                                                                                                                                                                                                 |   |   |          |         |             | CIA         | External     | Total |
| 26UEIT31     | 4                                                                                                                                                                                                                                                                                                                                               | 0 | 0 | III      | 3       | 4           | 50          | 50           | 100   |
|              | Learning Objectives                                                                                                                                                                                                                                                                                                                             |   |   |          |         |             |             |              |       |
| LO1          | To provide knowledge on fundamentals of number system                                                                                                                                                                                                                                                                                           |   |   |          |         |             |             |              |       |
| LO2          | To have the ability to know the logic gates .                                                                                                                                                                                                                                                                                                   |   |   |          |         |             |             |              |       |
| LO3          | To know the basics of combinational logic analysis                                                                                                                                                                                                                                                                                              |   |   |          |         |             |             |              |       |
| LO4          | To understand latches and flip-flops                                                                                                                                                                                                                                                                                                            |   |   |          |         |             |             |              |       |
| LO5          | To know about memory and storage                                                                                                                                                                                                                                                                                                                |   |   |          |         |             |             |              |       |
| Unit         | Contents                                                                                                                                                                                                                                                                                                                                        |   |   |          |         |             |             | No. of Hours |       |
| I            | <b>Number System and Codes:</b> Decimal Numbers, Binary Numbers, Decimal to Binary Conversions, Binary Arithmetic, 1's and 2's Complements of Binary Numbers, Signed Numbers, Arithmetic Operations with Signed Numbers, Hexadecimal Numbers, Octal Numbers, Digital Codes, Error Detection Codes.                                              |   |   |          |         |             |             | 12           |       |
| II           | <b>Logic Gates:</b> The Inverter, The AND Gate, The OR Gate, The NAND Gate, The NOR Gate, The Exclusive–OR Gate and Exclusive–NOR Gate.<br><b>Boolean Algebra and Logic Simplification:</b> Boolean Operations and Expressions, Laws and Rules, De Morgan's Theorems, Boolean Expressions and Truth Tables, The Karnaugh Map, SOP Minimization. |   |   |          |         |             |             | 12           |       |
| III          | <b>Combinational Logic Analysis:</b> Basic Combinational Logic Circuits, Implementing Combinational Logic, The Universal Property of NAND and NOR Gates.<br><b>Functions of Combinational Logic:</b> Basic Adder, Parallel Binary Adders, Comparators, Decoders, Encoders, Code Converters, Multiplexers, Parity Generators and Checkers.       |   |   |          |         |             |             | 12           |       |
| IV           | <b>Latches and Flip-Flops:</b> Latches, Edge-Triggered Flip-Flops, Flip-Flop Operating Characteristics, Flip-Flop Applications, Registers, Counters-Shift Registers & its Types,.                                                                                                                                                               |   |   |          |         |             |             | 12           |       |

|           |                                                                                                                                                                |           |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| V         | <b>Memory and Storage:</b> Memory Basics, RAM, ROM, Programmable ROMs, Flash Memory, Memory Expansion, Special Types of Memories, Magnetic and Optical Storage | <b>12</b> |
|           | <b>TOTAL HOURS</b>                                                                                                                                             | <b>60</b> |
| <b>CO</b> | <b>Course Outcomes</b>                                                                                                                                         |           |
| CO1       | Identify the logic gates and their functionality                                                                                                               |           |
| CO2       | Perform number conversions from one system to another system                                                                                                   |           |
| CO3       | Design basic electronic circuits (combinational circuits)                                                                                                      |           |
| CO4       | Perform a comparative analysis of the components of different memory units                                                                                     |           |
| CO5       | Perform number conversions                                                                                                                                     |           |
|           | <b>Text Books</b>                                                                                                                                              |           |
| 1         | Floyd, Thomas L, —Digital Computer Fundamentals, 10th Edition, University Book Stall, 1997                                                                     |           |
|           | <b>Reference Books</b>                                                                                                                                         |           |
| 1         | Malvino, Paul Albert and Leach, Donald P,—Digital Principles and Applications, 4th Edition, TMH, 2000                                                          |           |
| 2         | Malvino, Paul Albert and Leach, Donald P,—Digital Computer Fundamentals, 3rd Edition, TMH, 1995                                                                |           |
| 3         | Bartee, Thomas C,—Digital Computer Fundamentals, 6th Edition, TMH, 1995                                                                                        |           |

**Mapping Table:**

| CO/PSO                                             | PSO 1     | PSO 2     | PSO 3     | PSO 4     | PSO 5     | PSO 6     |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                | 3         | 2         | 2         | 2         | 2         | 2         |
| CO2                                                | 2         | 3         | 2         | 2         | 2         | 2         |
| CO3                                                | 2         | 3         | 3         | 3         | 2         | 2         |
| CO4                                                | 2         | 3         | 2         | 2         | 2         | 2         |
| CO5                                                | 3         | 3         | 2         | 2         | 2         | 2         |
| <b>Weightage of course contributed to each PSO</b> | <b>12</b> | <b>14</b> | <b>11</b> | <b>11</b> | <b>10</b> | <b>10</b> |

**S-Strong-3    M-Medium-2            L-Low-1**

**ELECTIVE COURSE III B: COMPUTER ARCHITECTURE**

| Subject Code        | L                                                                                                                                                                                                                                                                                                                                                                                                                                                | T | P | Semester | Credits | Inst. Hours | Marks |              |       |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------|--------------|-------|
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |   |          |         |             | CIA   | External     | Total |
| 26UEIT32            | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0 | 0 | III      | 3       | 4           | 50    | 50           | 100   |
| Learning Objectives |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |   |          |         |             |       |              |       |
| LO1                 | To impart basic concepts of computer architecture and organization                                                                                                                                                                                                                                                                                                                                                                               |   |   |          |         |             |       |              |       |
| LO2                 | To explain key skills of constructing cost-effective computer systems                                                                                                                                                                                                                                                                                                                                                                            |   |   |          |         |             |       |              |       |
| LO3                 | To familiarize the basic CPU organization                                                                                                                                                                                                                                                                                                                                                                                                        |   |   |          |         |             |       |              |       |
| LO4                 | To help students in understanding various memory devices                                                                                                                                                                                                                                                                                                                                                                                         |   |   |          |         |             |       |              |       |
| LO5                 | To facilitate students in learning I/O communication                                                                                                                                                                                                                                                                                                                                                                                             |   |   |          |         |             |       |              |       |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |   |          |         |             |       |              |       |
| Unit                | Contents                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |   |          |         |             |       | No. of Hours |       |
| I                   | STRUCTURE OF COMPUTERS :Computer types, Functional units, Basic operational concepts, Von Neumann Architecture, Bus structures, Software, Performance, Multiprocessors and Multicomputer systems, Data representation, Fixed and floating point representation, Error detection and correction codes.                                                                                                                                            |   |   |          |         |             |       | 12           |       |
| II                  | BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and interrupt. Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs. RISC |   |   |          |         |             |       | 12           |       |

|     |                                                                                                                                                                                                                                                                                |    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| III | <b>COMPUTER ARITHMETIC:</b> Addition And Subtraction, Multiplication Algorithms, division Algorithms, Floating – point Arithmetic Operation , decimal Arithmetic Unit, Decimal arithmetic Operations                                                                           | 12 |
| IV  | <b>MEMORY SYSTEM:</b> Memory Hierarchy, Main Memories, Auxiliary Memory ,Associative Memory, Cache Memory, Performance considerations, Virtual memory, Paging, , RAID                                                                                                          | 12 |
| V   | <b>INPUT OUTPUT:</b> I/O interface, Asynchronous Data Transfer, Mode of Transfer, DMA. <b>MULTIPROCESSORS:</b> Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache Coherence | 12 |

| TOTAL HOURS     |                                                                                                                                              | 60 |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------|----|
| CO              | Course Outcomes                                                                                                                              |    |
|                 | The student will be able to:                                                                                                                 |    |
| CO1             | Identify various components of a computer and their interconnection                                                                          |    |
| CO2             | Identify basic components and design of the CPU: the ALU and control unit                                                                    |    |
| CO3             | Compare and select various memory devices as per requirement                                                                                 |    |
| CO4             | Compare various types of I/O mapping techniques                                                                                              |    |
| CO5             | Critique the performance issues of cache memory and virtual memory                                                                           |    |
| Text Books      |                                                                                                                                              |    |
| 1               | M.Moris Mano(2006),Computer System Architecture,3 <sup>rd</sup> edition, Pearson/PHI, India                                                  |    |
| Reference Books |                                                                                                                                              |    |
| 1               | Carl Hamacher, Zvonko Vranesic, and Safa Zaky (2002), <i>Computer Organization</i> , 5th Edition, McGraw Hill, New Delhi, India.             |    |
| 2               | William Stallings (2010), <i>Computer Organization and Architecture: Designing for Performance</i> , 8th Edition, Prentice Hall, New Jersey. |    |

|   |                                                                                                           |
|---|-----------------------------------------------------------------------------------------------------------|
| 3 | Andrew S. Tanenbaum (2006), <i>Structured Computer Organization</i> , 5th Edition, Pearson Education Inc. |
| 4 | John P. Hayes (1998), <i>Computer Architecture and Organization</i> , 3rd Edition, Tata McGraw Hill.      |

**Mapping Table:**

| CO/PSO                                                 | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|--------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                    | 3         | 2         | 2         | 2         | 2         | 2         |
| CO2                                                    | 2         | 3         | 2         | 2         | 2         | 2         |
| CO3                                                    | 2         | 3         | 3         | 3         | 2         | 2         |
| CO4                                                    | 2         | 3         | 2         | 2         | 2         | 2         |
| CO5                                                    | 3         | 3         | 2         | 2         | 2         | 2         |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>12</b> | <b>14</b> | <b>11</b> | <b>11</b> | <b>10</b> | <b>10</b> |

**S-Strong-3      M-Medium-2      L-Low-1**

## SKILL ENHANCEMENT COURSE IV:HTML &WEB DESIGNING LAB

| Subject Code | L | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|--------------|---|---|---|----------|---------|-------------|-------------|----------|-------|
|              |   |   |   |          |         |             | CIA         | External | Total |
| 26USITP3     | 0 | 0 | 2 | III      | 2       | 2           | 50          | 50       | 100   |

### Learning Objectives

|            |                                                        |
|------------|--------------------------------------------------------|
| <b>LO1</b> | To get the knowledge about HTML tags                   |
| <b>LO2</b> | To understand the usage of ordered and unordered lists |

|            |                                   |
|------------|-----------------------------------|
| <b>LO3</b> | To understand the usage of links  |
| <b>LO4</b> | To understand the usage of tables |
| <b>LO5</b> | To understand the usage of frames |

### Contents

1. Write HTML code to design a page containing some text in a paragraph by giving suitable heading style.
2. Create a page to show different character formatting (B, I, U, SUB, SUP) tags.
3. Apply various colors to suitably distinguish key words, also apply font styling like italics, underline and two other fonts to words you find appropriate, also use header tags.
4. Create a web page showing an ordered list of all second semester courses.
5. Create a web page showing an unordered list of names of all the Diploma Programmes (Branches) in your institution.
6. Write a program using HTML to design a Bio-Data.
7. Create a web page for internal links; when the user clicks on different links on the web page it should go to the appropriate locations/sections in the same page.
8. Use tables to provide layout to your HTML page describing your college infrastructure.
9. Create a web page using HTML5 <audio> and <video> tags to display audio and video clips (modern replacement for frames).
10. Write an HTML program to create a feedback form with text fields, email field, textarea and submit button.
11. Create an image gallery using <figure> and <figcaption> tags to display images with captions.
12. Create a web page with external links to websites and email links using <a> tag.

|                    |    |
|--------------------|----|
| <b>TOTAL HOURS</b> | 30 |
|--------------------|----|

| <b>CO</b> | <b>Course Outcomes</b>                                  |
|-----------|---------------------------------------------------------|
| CO1       | Describe the basics of HTML and web design              |
| CO2       | The students are able to understand the usage of lists  |
| CO3       | The students are able to understand the usage of links  |
| CO4       | The students are able to understand the usage of tables |
| CO5       | The students are able to understand the usage of frames |

**Mapping Table:**

| <b>CO/PSO</b>                                          | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> |
|--------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                                             | <b>3</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    |
| <b>CO2</b>                                             | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    |
| <b>CO3</b>                                             | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    |
| <b>CO4</b>                                             | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    |
| <b>CO5</b>                                             | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>15</b>   | <b>14</b>   | <b>14</b>   | <b>14</b>   | <b>11</b>   | <b>11</b>   |

**S-Strong-3    M-Medium-2    L-Low-1**

### SKILL ENHANCEMENT COURSE–V[LAB]-ANIMATION LAB

| Subject Code               | L                                                                                                                                                                                                                                                                                                                                                                                                                                                       | T | P | Semester | Credits | Inst. Hours | Total Marks |                     |       |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|---------------------|-------|
|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |   |          |         |             | CIA         | External            | Total |
| 26USITP4                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0 | 2 | III      | 2       | 2           | 50          | 50                  | 100   |
| <b>Learning Objectives</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |   |          |         |             |             |                     |       |
| <b>LO1</b>                 | To understand the basic tools and features of GIMP for image editing.                                                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             |             |                     |       |
| <b>LO2</b>                 | To learn techniques for manipulating images, including layers, paths, colors, and filters.                                                                                                                                                                                                                                                                                                                                                              |   |   |          |         |             |             |                     |       |
| <b>LO3</b>                 | To develop skills in designing graphics such as logos, book covers, and photo enhancements.                                                                                                                                                                                                                                                                                                                                                             |   |   |          |         |             |             |                     |       |
| <b>LO4</b>                 | To understand animation concepts using GIMP and create simple animations and storyboards.                                                                                                                                                                                                                                                                                                                                                               |   |   |          |         |             |             |                     |       |
| <b>LO5</b>                 | To learn the basics of Flash for creating animations and adding interactivity using scripts.                                                                                                                                                                                                                                                                                                                                                            |   |   |          |         |             |             |                     |       |
| <b>Unit</b>                | <b>Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |   |          |         |             |             | <b>No. of Hours</b> |       |
| I                          | GIMP's Tools- Taking Advantage of Paths - Working with Layers and masks - Using Channels<br><br><b>Exercises:</b> <ol style="list-style-type: none"> <li>1. Enlarge a Logo using path</li> <li>2. Create an ink drawing using path</li> <li>3. Replace Background of image using Channels</li> </ol>                                                                                                                                                    |   |   |          |         |             |             | 6                   |       |
| II                         | Manipulating Images: Transforming Images - Using The Image Tools - Adjusting Colors - Working with Text - Painting in Gimp: Creating new brushes - Enhancing Photos - Exploring Filters and Effects.<br><br><b>Exercises:</b> <ol style="list-style-type: none"> <li>1. Design Front Cover for a Book.</li> <li>2. Create a customized logo</li> <li>3. Use clone tool to remove text from an image</li> <li>4. Remove Red eye using Filter.</li> </ol> |   |   |          |         |             |             | 6                   |       |
| III                        | Using GIMP animation package - Managing the Frames of Image Sequence with GAP - Morphing - onion skinning - Creating a Storyboard.                                                                                                                                                                                                                                                                                                                      |   |   |          |         |             |             | 6                   |       |

|                        |                                                                                                                                                                                                                                                                                                                                                |           |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                        | <p style="text-align: center;"><b>Exercises:</b></p> <ol style="list-style-type: none"><li>1. Morphing - Create smooth transitions from one image to another.</li><li>2. Create a Story board for your project</li></ol>                                                                                                                       |           |
| IV                     | <p>Flash: Introduction - Creating and Editing Objects - Color and Text.<br/>Animations: Frame- by- frame animation-Motion Tweening- Motion Guides</p> <ol style="list-style-type: none"><li>1. Creating Frame-by-frame Animation</li><li>2. Create a Motion Tween for Graphic and Text Object</li><li>3. Create a Motion guide Layer</li></ol> | 6         |
| V                      | <p>Shape Tweening - Masking - Interactivity: Adding Script to Buttons - Testing and Publishing.</p> <p style="text-align: center;"><b>Exercises:</b></p> <ol style="list-style-type: none"><li>1. Create a Shape Tween for Graphic Object</li><li>2. Create a Mask Layer</li><li>3. Adding buttons with Action Script</li></ol>                | 6         |
| <b>TOTAL HOURS</b>     |                                                                                                                                                                                                                                                                                                                                                | <b>30</b> |
| <b>CO</b>              | <b>Course Outcomes</b>                                                                                                                                                                                                                                                                                                                         |           |
| CO1                    | Demonstrate understanding and use of multimedia fundamentals                                                                                                                                                                                                                                                                                   |           |
| CO2                    | Implement appropriate techniques required for editing images and designing animated system.                                                                                                                                                                                                                                                    |           |
| CO3                    | Solve various design and implementation issues materialize on the development of multimedia systems.                                                                                                                                                                                                                                           |           |
| CO4                    | Assess different Photo Editing, Video Editing and animation tools and select the appropriate tool based on the requirements.                                                                                                                                                                                                                   |           |
| CO5                    | Design and develop Multimedia Projects.                                                                                                                                                                                                                                                                                                        |           |
| <b>Text Books</b>      |                                                                                                                                                                                                                                                                                                                                                |           |
| 1.                     | Jason Van Gumster& Robert Shimonski (2010), “GIMP Bible”, Wiley, 2nd edition.                                                                                                                                                                                                                                                                  |           |
| 2.                     | Chris Gover, 2010, “Flash CS5: The missing Manual”, 1st Edition, O” Reilly India.                                                                                                                                                                                                                                                              |           |
| <b>Reference Books</b> |                                                                                                                                                                                                                                                                                                                                                |           |

|                      |                                                                                                                                     |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| 1                    | Juan Manuel Ferreyra (2011), “GIMP 2.6 Cookbook”, PACK publishing Ltd.                                                              |
| 2                    | Robert Reinhard (2003), “Macromedia Flash MX Bible”, Wiley Dreamtech India Pvt Ltd.                                                 |
| <b>Web Resources</b> |                                                                                                                                     |
| 1                    | <a href="https://www.youtube.com/watch?v=T8NIK3RdoIc">https://www.youtube.com/watch?v=T8NIK3RdoIc</a> (Unit IV: Gimp Video Editing) |
| 2                    | <a href="https://www.youtube.com/watch?v=Jz9WrbELGYA">https://www.youtube.com/watch?v=Jz9WrbELGYA</a>                               |

**Mapping Table:**

| CO/PSO                                             | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|----------------------------------------------------|------|------|------|------|------|------|
| CO1                                                | 3    | 2    | 3    | 3    | 2    | 2    |
| CO2                                                | 3    | 3    | 3    | 3    | 2    | 2    |
| CO3                                                | 3    | 3    | 3    | 2    | 2    | 3    |
| CO4                                                | 3    | 3    | 3    | 3    | 3    | 2    |
| CO5                                                | 3    | 3    | 2    | 3    | 2    | 2    |
| <b>Weightage of course contributed to each PSO</b> | 15   | 14   | 14   | 14   | 11   | 11   |

**S-Strong-3    M-Medium-2            L-Low-1**

## COMMON - ENVIRONMENTAL SCIENCE

| Subject Code        | L                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | T | P | Semester | Credits | Inst. Hours | Total Marks |          |              |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|--------------|
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |   |   |          |         |             | CIA         | External | Total        |
| 26UEVS31            | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0 | 0 | III      | 2       | 2           | 50          | 50       | 100          |
| Learning Objectives |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |   |   |          |         |             |             |          |              |
| LO1                 | To study the multidisciplinary nature of environmental studies, including the scope, importance, and sustainable management of natural resources such as forests, water, minerals, food, energy, and land.                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |          |         |             |             |          |              |
| LO2                 | To understand different types of ecosystems, energy flow, ecological succession, food chains, food webs, and ecological pyramids.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |   |   |          |         |             |             |          |              |
| LO3                 | To examine the levels of biodiversity, its distribution in India and globally, threats to biodiversity, and conservation strategies including in-situ and ex-situ methods.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |          |         |             |             |          |              |
| LO4                 | To identify causes, effects, and control measures of various types of pollution, and to understand solid waste management and disaster management techniques.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |   |          |         |             |             |          |              |
| LO5                 | To analyze social and environmental issues such as climate change, global warming, and population growth, along with environmental protection laws and sustainable development practices.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |   |          |         |             |             |          |              |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |   |   |          |         |             |             |          |              |
| Unit                | Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |   |          |         |             |             |          | No. of Hours |
| I                   | <b>THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES</b><br><br>Definition, scope and importance Natural resources and associated problems:<br>a) Forest resources: Use and over-exploitation, deforestation, timber extraction, dams and their effects on forests and tribal people.<br>b) Water resources: Use and over-utilization of surface and ground water, floods, drought, dams-benefits and problems, water conservation and watershed management.<br>c) Mineral resources: Use and exploitation, environmental effects.<br>d) Food resources: World food problems, changes, effects of modern agriculture, fertilizer-pesticide problems. |   |   |          |         |             |             |          | 6            |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                    | <p>e) Energy resources: Growing energy needs, renewables and renewable energy sources, alternate energy sources.</p> <p>f) Land resources: Land as a resource, land degradation, man-induced landslides, soil erosion and desertification.</p>                                                                                                                                                                                                                         |           |
| <b>II</b>          | <p><b>ECOSYSTEMS :</b></p> <p>a) Forest Ecosystem    b) Grassland Ecosystem    c) Desert ecosystem</p> <p>d) Aquatic Ecosystem (Ponds, rivers, oceans, estuaries) Energy flow in the ecosystem. Ecological succession Food Chains, Food Webs and Ecological Pyramids.</p>                                                                                                                                                                                              | <b>6</b>  |
| <b>III</b>         | <p><b>BIODIVERSITY AND ITS CONSERVATION:</b></p> <p>Introduction    Definition: Genetic, species and ecosystem diversity. Biogeographically classification of India ,Values of Biodiversity, Biodiversity at global, national and local levels India as a mega-diversity nation,</p> <p>Hot-Spots of biodiversity Threats to biodiversity Endangered and endemic species of India , Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity</p> | <b>6</b>  |
| <b>IV</b>          | <p><b>ENVIRONMENTAL POLLUTION:</b></p> <p>Definition- Causes, effects and control measures of:-Air Pollution    b) Water Pollution    c) Soil Pollution    d) Marine Pollution    e) Noise Pollution    f) Thermal Pollution . Solid Waste Management, Disaster Management: Floods, earthquake, cyclone and landslides.</p>                                                                                                                                            | <b>6</b>  |
| <b>V</b>           | <p><b>SOCIAL ISSUES AND THE ENVIRONMENT:</b></p> <p>Climatic change, global warming, acid rain, ozone depletion. Wasteland reclamation Consumerism and Waste products, use and through plastics Environment Protection Act Air (Prevention and Control of Pollution) Act Water (Prevention and Control of Pollution) Act Wildlife Protection Act Forest Conservation Act Population Explosion - Family Welfare Programme Human Rights</p>                              | <b>6</b>  |
| <b>TOTAL HOURS</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>30</b> |

| <b>CO</b>              | <b>Course Outcomes</b>                                                                                                                                                             |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b>             | Students will be able to explain the scope and importance of environmental studies and analyze the use, over-exploitation, and conservation of natural resources.                  |
| <b>CO2</b>             | Students will be able to describe ecosystem types, energy flow, ecological succession, and relationships such as food chains, food webs, and ecological pyramids.                  |
| <b>CO3</b>             | Students will be able to assess biodiversity at different levels, identify threats, and explain conservation methods including in-situ and ex-situ approaches.                     |
| <b>CO4</b>             | Students will be able to identify various types of pollution, analyze their causes and effects, and suggest control measures along with waste and disaster management practices.   |
| <b>CO5</b>             | Students will be able to evaluate major environmental issues such as climate change and population growth, and understand environmental protection laws and sustainable practices. |
| <b>Reference Books</b> |                                                                                                                                                                                    |
| 1                      | N. Arumugam and V. Kumaresan, 2014, Environmental studies, 4th edition, Saras Publication, Nagercoil, TamilNadu.                                                                   |
| 2                      | M. Basu, and S. Xavier, 2016, Fundamentals of Environmental Studies, Cambridge University Press.                                                                                   |
| 3                      | A.K. Mitra and R. Chakraborty, 2016, Introduction to Environmental Studies, Book Syndicate.                                                                                        |
| 4                      | J.S. Singh, S.P.Singh, and S.R. Gupta, 2014, Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.                                                      |

Mapping Table:

| <b>CO/PSO</b>                                          | <b>PSO 1</b> | <b>PSO 2</b> | <b>PSO 3</b> | <b>PSO 4</b> | <b>PSO 5</b> | <b>PSO 6</b> |
|--------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>CO1</b>                                             | <b>3</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO2</b>                                             | <b>2</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO3</b>                                             | <b>2</b>     | <b>3</b>     | <b>3</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO4</b>                                             | <b>2</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO5</b>                                             | <b>3</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>12</b>    | <b>14</b>    | <b>11</b>    | <b>11</b>    | <b>10</b>    | <b>10</b>    |

# Semester-IV

## CORE – VII: OPERATING SYSTEMS

| Subject Code | L                                                                                                                                                                                                                                                                                                                                                                                                 | T | P | Semester | Credits | Inst. Hours | Total Marks |          |                     |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|---------------------|
|              |                                                                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             | CIA         | External | Total               |
| 26UCIT41     | 4                                                                                                                                                                                                                                                                                                                                                                                                 | 0 | 0 | IV       | 4       | 4           | 50          | 50       | 100                 |
|              | <b>Learning Objectives</b>                                                                                                                                                                                                                                                                                                                                                                        |   |   |          |         |             |             |          |                     |
| <b>LO1</b>   | To impart basic concepts of Operating System                                                                                                                                                                                                                                                                                                                                                      |   |   |          |         |             |             |          |                     |
| <b>LO2</b>   | To explain about process concept, scheduling, and synchronization                                                                                                                                                                                                                                                                                                                                 |   |   |          |         |             |             |          |                     |
| <b>LO3</b>   | To understand deadlock and memory management                                                                                                                                                                                                                                                                                                                                                      |   |   |          |         |             |             |          |                     |
| <b>LO4</b>   | To help students to understand the file system                                                                                                                                                                                                                                                                                                                                                    |   |   |          |         |             |             |          |                     |
| <b>LO5</b>   | To understand the UNIX operating system operations                                                                                                                                                                                                                                                                                                                                                |   |   |          |         |             |             |          |                     |
| <b>Unit</b>  | <b>Contents</b>                                                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             |             |          | <b>No. of Hours</b> |
| I            | <b>Introduction:</b> Operating system - Computer System Organization-<br>Operating System Structure – Operations – Process Management –<br>Memory Management – Storage Management – Protection and Security<br><b>System structures:</b> Operating system services – user operating system<br>interface – system calls – types of system calls – System programs -<br>operating system structure. |   |   |          |         |             |             |          | 12                  |
| II           | <b>Process Concept:</b> Process Scheduling – Operations on Processes – Inter<br>Process Communication <b>Process Scheduling:</b> Basic concepts -<br>Scheduling Criteria – Scheduling Algorithms <b>Synchronization:</b><br>Background – Critical Section Problem – Mutex locks - Semaphores –<br>Classic problems of synchronization                                                             |   |   |          |         |             |             |          | 12                  |
| III          | <b>Deadlocks:</b> System Model – Deadlock Characterization - Methods of<br>Handling Deadlocks – Deadlock prevention – Deadlock Avoidance<br><b>Memory Management Strategies:</b> Background – Swapping - Contiguous<br>Memory allocation – Segmentation – Paging Virtual Memory<br>Management: Background – Demand Paging – Page replacement .                                                    |   |   |          |         |             |             |          | 12                  |
| IV           | <b>File System:</b> File Concept – Access Methods – Directory and Disk<br>Structure– Protection. <b>Implementing File System:</b> File System Structure                                                                                                                                                                                                                                           |   |   |          |         |             |             |          | 12                  |

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|             | – File system Implementation –Directory Implementation –Allocation Methods <b>Mass storage structure:</b> Overview of mass storage structure – Disk structure – disk scheduling- Disk Management                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |
| V           | UNIX : The file system : the file – The HOME variable – pwd – cd – mkdir – rmdir – absolute and relative pathnames – ls – The UNIX file system. Handling ordinary files : cat – cp – rm – mv – more – lp – file – wc – od – cmp – comm – diff – gzip – gunzip – tar – zip – unzip. Basic file attributes : ls options – file ownership – file permission – chmod – directory permission – changing file ownership. Essential shell programming : shell scripts – read – using command line arguments – exit – the logical operators – if conditional – test – case – expr – \$0 calling a script by different names – while – for – set and shift – the here document – trap – set -x – sample validations and data entry scripts - Functions in Shell Script | 12 |
| TOTAL HOURS |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 60 |
|             | Course Outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |    |
| CO1         | Describe the basic concepts of operating system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |
| CO2         | Illustrate how UNIX implements file system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
| CO3         | Analyze the CPU Scheduling Algorithms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |
| CO4         | Compare the Memory Management Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| CO5         | Explore several tools to solve process Synchronization problems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |
| Text Books  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |
| 1           | Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, <i>Operating System Concepts</i> , John Wiley & Sons (Asia), Ninth Edition, 2014.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |    |
| 2           | Sumitabha Das, <i>UNIX Concepts and Applications</i> , Tata McGraw Hill Publications, Third Edition, 2017.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |

| Reference Books |                                                                                             |
|-----------------|---------------------------------------------------------------------------------------------|
| 1               | Gary J. Nutt, <i>Operating Systems</i> , Pearson Education Asia, 2nd Edition, 2012.         |
| 2               | H. M. Deitel, <i>Operating Systems</i> , Addison-Wesley Publishing Company, Second Edition. |

**MAPPING TABLE:**

| CO/PSO                                                 | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 |
|--------------------------------------------------------|-------|-------|-------|-------|-------|-------|
| CO1                                                    | 3     | 2     | 2     | 2     | 2     | 2     |
| CO2                                                    | 2     | 3     | 2     | 2     | 2     | 2     |
| CO3                                                    | 2     | 3     | 3     | 3     | 2     | 2     |
| CO4                                                    | 2     | 3     | 2     | 2     | 2     | 2     |
| CO5                                                    | 3     | 3     | 2     | 2     | 2     | 2     |
| <b>Weightage of course<br/>contributed to each PSO</b> | 12    | 14    | 11    | 11    | 10    | 10    |

**S-Strong-3**

**M-Medium-2**

**L-Low-1**

## CORE COURSE VIII : MOBILE APPLICATION DEVELOPMENT LAB

| Subject Code                                                                                                                                                                                                                                                                                                                                                          | L                                                                | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|-------|
|                                                                                                                                                                                                                                                                                                                                                                       |                                                                  |   |   |          |         |             | CIA         | External | Total |
| 26UITP4                                                                                                                                                                                                                                                                                                                                                               | 0                                                                | 0 | 6 | IV       | 4       | 6           | 50          | 50       | 100   |
| Learning Objectives                                                                                                                                                                                                                                                                                                                                                   |                                                                  |   |   |          |         |             |             |          |       |
| LO1                                                                                                                                                                                                                                                                                                                                                                   | To get the knowledge to write programs using Android programming |   |   |          |         |             |             |          |       |
| LO2                                                                                                                                                                                                                                                                                                                                                                   | To understand mobile applications                                |   |   |          |         |             |             |          |       |
| LO3                                                                                                                                                                                                                                                                                                                                                                   | To understand the basic concepts of Android Studio               |   |   |          |         |             |             |          |       |
| LO4                                                                                                                                                                                                                                                                                                                                                                   | To understand the application development methods                |   |   |          |         |             |             |          |       |
| LO5                                                                                                                                                                                                                                                                                                                                                                   | To understand the deployment methods                             |   |   |          |         |             |             |          |       |
| Contents                                                                                                                                                                                                                                                                                                                                                              |                                                                  |   |   |          |         |             |             |          |       |
| 1. Layout with Flexbox<br>2. Breaking down a UI into components<br>3. Dealing with the keyboard<br>4. Listing data with the FlatList<br>5. Persistent storage<br>6. Dealing with remote images on slow networks<br>7. Playing with animations<br>8. Complex navigation structure<br>9. Build a swiper component<br>10. Making a declarative API for an imperative API |                                                                  |   |   |          |         |             |             |          |       |
| CO                                                                                                                                                                                                                                                                                                                                                                    | Course Outcomes                                                  |   |   |          |         |             |             |          |       |
| CO1                                                                                                                                                                                                                                                                                                                                                                   | Apply the basic elements                                         |   |   |          |         |             |             |          |       |
| CO2                                                                                                                                                                                                                                                                                                                                                                   | Implementing the components                                      |   |   |          |         |             |             |          |       |
| CO3                                                                                                                                                                                                                                                                                                                                                                   | Using the persistent storage                                     |   |   |          |         |             |             |          |       |
| CO4                                                                                                                                                                                                                                                                                                                                                                   | Playing with animations                                          |   |   |          |         |             |             |          |       |
| CO5                                                                                                                                                                                                                                                                                                                                                                   | Displaying remote images and building app with API               |   |   |          |         |             |             |          |       |

**Mapping Table:**

| <b>CO/PSO</b>                                          | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> |
|--------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| CO1                                                    | 3           | 2           | 3           | 3           | 2           | 2           |
| CO2                                                    | 3           | 3           | 3           | 3           | 2           | 2           |
| CO3                                                    | 3           | 3           | 3           | 2           | 2           | 3           |
| CO4                                                    | 3           | 3           | 3           | 3           | 3           | 2           |
| CO5                                                    | 3           | 3           | 2           | 3           | 2           | 2           |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>15</b>   | <b>14</b>   | <b>14</b>   | <b>14</b>   | <b>11</b>   | <b>11</b>   |

**S-Strong-3    M-Medium-2            L-Low-1**

## ELECTIVE IV A: INTERNET OF THINGS AND ITS APPLICATIONS

[illegible]

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| III                    | IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.                                                                                                               | 12        |
| IV                     | IoT Applications for Value Creations Introduction, IoT applications for industry: Future FactoryConcepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and GasIndustry, Opinions on IoT Application and Value for Industry, Home Management- IoT Applications in Healthcare and Smart Cities | 12        |
| V                      | Internet of Things Privacy, Security and Governance – Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities – Security, IoT Threat Modeling and Risk Assessment, Blockchain for IoT Security and Governance .    | 12        |
|                        | <b>TOTAL HOURS</b>                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>60</b> |
| <b>Course Outcomes</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |
| CO                     | <b>On completion of this course, students will be able to:</b>                                                                                                                                                                                                                                                                                                                                                                          |           |
| 1                      | Work with big data tools and its analysis techniques.                                                                                                                                                                                                                                                                                                                                                                                   |           |
| 2                      | Analyze data by utilizing clustering and classification algorithms.                                                                                                                                                                                                                                                                                                                                                                     |           |
| 3                      | Learn and apply different mining algorithms and recommendation systems for large volumes of data.                                                                                                                                                                                                                                                                                                                                       |           |
| 4                      | Perform analytics on data streams.                                                                                                                                                                                                                                                                                                                                                                                                      |           |
| 5                      | Learn NoSQL databases and their management.                                                                                                                                                                                                                                                                                                                                                                                             |           |

| Text Book       |                                                                                                                                                                                                                |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1               | Vijay Madiseti and Arshdeep Bahga, <i>Internet of Things: A Hands-on Approach</i> , Universities Press (India) Private Limited, 2014, 1st Edition.                                                             |
| Reference Books |                                                                                                                                                                                                                |
| 1.              | Michael Miller, <i>The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World</i> , Kindle version.                                                               |
| 2.              | Francis da Costa, <i>Rethinking the Internet of Things: A Scalable Approach to Connecting Everything</i> , Apress Publications, 2013, 1st Edition.                                                             |
| 3               | Waltenegus Dargie and Christian Poellabauer, <i>Fundamentals of Wireless Sensor Networks: Theory and Practice</i> . □ Cuno Pfister, <i>Getting Started with the Internet of Things</i> , O'Reilly Media, 2011. |
| Web Resources   |                                                                                                                                                                                                                |
| 1.              | <a href="https://www.simplilearn.com">https://www.simplilearn.com</a>                                                                                                                                          |
| 2.              | <a href="https://www.javatpoint.com">https://www.javatpoint.com</a>                                                                                                                                            |
| 3.              | <a href="https://www.w3schools.com">https://www.w3schools.com</a>                                                                                                                                              |

### Mapping Table:

| CO/PSO                                             | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                | 3         | 2         | 3         | 3         | 2         | 2         |
| CO2                                                | 3         | 3         | 3         | 3         | 2         | 2         |
| CO3                                                | 3         | 3         | 3         | 2         | 2         | 3         |
| CO4                                                | 3         | 3         | 3         | 3         | 3         | 2         |
| CO5                                                | 3         | 3         | 2         | 3         | 2         | 2         |
| <b>Weightage Of course contributed to each PSO</b> | <b>15</b> | <b>14</b> | <b>14</b> | <b>14</b> | <b>11</b> | <b>11</b> |

S-Strong-3    M-Medium-2    L-Low-1

## ELECTIVE IV B: HUMAN COMPUTER INTERACTION

| Subject Code       | L                                                                                                                                                                                                                                                                                                                                                                                                     | T | P | Semester | Credits | Inst. Hours | Total Marks |          |              |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|--------------|
|                    |                                                                                                                                                                                                                                                                                                                                                                                                       |   |   |          |         |             | CIA         | External | Total        |
| 26UEIT42           | 4                                                                                                                                                                                                                                                                                                                                                                                                     | 0 | 0 | IV       | 3       | 4           | 50          | 50       | 100          |
| Learning Objective |                                                                                                                                                                                                                                                                                                                                                                                                       |   |   |          |         |             |             |          |              |
| LO1                | To learn about the foundations of Human Computer Interaction.                                                                                                                                                                                                                                                                                                                                         |   |   |          |         |             |             |          |              |
| LO2                | To learn the design and software process technologies.                                                                                                                                                                                                                                                                                                                                                |   |   |          |         |             |             |          |              |
| LO3                | To learn HCI models and theories.                                                                                                                                                                                                                                                                                                                                                                     |   |   |          |         |             |             |          |              |
| LO4                | To learn the mobile ecosystem.                                                                                                                                                                                                                                                                                                                                                                        |   |   |          |         |             |             |          |              |
| LO5                | To learn the various types of Web Interface Design.                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             |             |          |              |
|                    |                                                                                                                                                                                                                                                                                                                                                                                                       |   |   |          |         |             |             |          |              |
| Unit               | Details                                                                                                                                                                                                                                                                                                                                                                                               |   |   |          |         |             |             |          | No. of Hours |
| I                  | FOUNDATIONS OF HCI:• The Human: I/O channels – Memory–• Reasoning and problem solving; The Computer: Devices – Memory – Processing and Networks;• Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity – Paradigms – Case Studies                                                                                                                                        |   |   |          |         |             |             |          | 12           |
| II                 | <b>DESIGN&amp;SOFTWARE PROCESS:</b> <ul style="list-style-type: none"> <li>Interactive Design: Basics–process– scenarios -Navigation: screen design Iteration and prototyping – HCI in software process: Software life cycle– usability engineering– Prototypinginpractice– designrationale.Designrules:principles,standards, guidelines, rules. Evaluation Techniques – Universal Design.</li> </ul> |   |   |          |         |             |             |          | 12           |
| III                | <b>MODELSAND THEORIES:</b> <ul style="list-style-type: none"> <li>HCI Models : Cognitive models:-Socio-Organizational issues and stakeholder requirements Communication and collaboration models-Hypertext, Multimedia and WWW.</li> </ul>                                                                                                                                                            |   |   |          |         |             |             |          | 12           |
| IV                 | <b>Mobile HCI:</b> <ul style="list-style-type: none"> <li>Mobile Ecosystem: Platforms, Application frameworks</li> <li>Types of Mobile Applications :Widgets, Applications, Games</li> </ul>                                                                                                                                                                                                          |   |   |          |         |             |             |          | 12           |

|                        |                                                                                                                                                                               |           |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                        | <ul style="list-style-type: none"><li>• MobileInformationArchitecture,Mobile2.0,</li><li>• Mobile Design: Elements of Mobile Design ,T ools. -Case Studies</li></ul>          |           |
| V                      | <b>WEB INTERFACE DESIGN:</b> Designing Web Interfaces–Drag& Drop, Direct Selection ,Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies         | 12        |
|                        | <b>TOTAL HOURS</b>                                                                                                                                                            | <b>60</b> |
| <b>Course Outcomes</b> |                                                                                                                                                                               |           |
| CO                     | Understand the fundamentals of HCI.                                                                                                                                           |           |
| CO1                    | Understand the design and software process technologies.                                                                                                                      |           |
| CO2                    | Understand HCI models and theories.                                                                                                                                           |           |
| CO3                    | Understand the mobile ecosystem, types of mobile applications, mobile architecture, and design.                                                                               |           |
| CO4                    | Understand the various types of Web Interface Design.                                                                                                                         |           |
| CO5                    | Understand the fundamentals of HCI.                                                                                                                                           |           |
| <b>Text Book</b>       |                                                                                                                                                                               |           |
| 1                      | Alan Dix, Janet Finlay, Gregory Abowd, and Russell Beale, <i>Human–Computer Interaction</i> , III Edition, Pearson Education, 2004. (Unit I, II & III)                        |           |
| 2                      | Brian Fling, <i>Mobile Design and Development</i> , I Edition, O’Reilly Media Inc., 2009. (Unit IV)                                                                           |           |
| 3                      | Bill Scott and Theresa Neil, <i>Designing Web Interfaces</i> , First Edition, O’Reilly, 2009. (Unit V)                                                                        |           |
| <b>Reference Books</b> |                                                                                                                                                                               |           |
| 1.                     | Ben Shneiderman, <i>Designing the User Interface: Strategies for Effective Human–Computer Interaction</i> , V Edition, Pearson Education.                                     |           |
| <b>Web Resources</b>   |                                                                                                                                                                               |           |
| 1.                     | <a href="https://www.interaction-design.org/literature/topics/human-computer-interaction">https://www.interaction-design.org/literature/topics/human-computer-interaction</a> |           |
| 2.                     | <a href="https://link.springer.com/10.1007/978-0-387-39940-9_192">https://link.springer.com/10.1007/978-0-387-39940-9_192</a>                                                 |           |
| 3.                     | <a href="https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction">https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction</a>                               |           |

**Mapping Table:**

| <b>CO/PSO</b>                                          | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> |
|--------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| CO1                                                    | 3           | 2           | 3           | 3           | 2           | 2           |
| CO2                                                    | 3           | 3           | 3           | 3           | 2           | 2           |
| CO3                                                    | 3           | 3           | 3           | 2           | 2           | 3           |
| CO4                                                    | 3           | 3           | 3           | 3           | 3           | 2           |
| CO5                                                    | 3           | 3           | 2           | 3           | 2           | 2           |
| <b>Weightage Of course<br/>contributed to each PSO</b> | <b>15</b>   | <b>14</b>   | <b>14</b>   | <b>14</b>   | <b>11</b>   | <b>11</b>   |

**S-Strong-3    M-Medium-2            L-Low-1**

## SKILL ENHANCEMENT COURSE VI: REACT LAB

| Subject Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | L                                                   | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|-------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                     |   |   |          |         |             | CIA         | External | Total |
| 26USITP5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0                                                   | 0 | 2 | IV       | 2       | 2           | 50          | 50       | 100   |
| Learning Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                     |   |   |          |         |             |             |          |       |
| LO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | To get the knowledge to write programs using React  |   |   |          |         |             |             |          |       |
| LO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | To understand the usage of functions                |   |   |          |         |             |             |          |       |
| LO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | To understand the usage of mapping                  |   |   |          |         |             |             |          |       |
| LO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | To understand the application of various components |   |   |          |         |             |             |          |       |
| LO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | To understand the usage of audio and video players  |   |   |          |         |             |             |          |       |
| Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                     |   |   |          |         |             |             |          |       |
| <ol style="list-style-type: none"> <li>1. Create an image gallery component that displays a list of images.</li> <li>2. Create a video player component that can play, pause, and control the volume of a video.</li> <li>3. Create an audio player component with play, pause, and volume controls.</li> <li>4. Create a component that allows users to upload an image and preview it before submission.</li> <li>5. Create a component that visualizes audio frequencies using the Web Audio API.</li> <li>6. Create an image slider that automatically transitions between images.</li> <li>7. Create a Picture-in-Picture (PiP) video player that allows users to watch a video in a small overlay window while continuing to browse the page.</li> <li>8. Create a component that allows users to draw annotations on an image.</li> <li>9. Create an interactive map component using a mapping library like Leaflet.</li> <li>10. Create a 3D model viewer using Three.js and React.</li> </ol> |                                                     |   |   |          |         |             |             |          |       |
| CO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Course Outcomes                                     |   |   |          |         |             |             |          |       |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Apply the basic elements                            |   |   |          |         |             |             |          |       |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Implement the components                            |   |   |          |         |             |             |          |       |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Use the audio and video players                     |   |   |          |         |             |             |          |       |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Play with animations                                |   |   |          |         |             |             |          |       |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Display various applications with React             |   |   |          |         |             |             |          |       |

**Mapping Table:**

| <b>CO/ PSO</b>                                         | <b>PSO 1</b> | <b>PSO 2</b> | <b>PSO 3</b> | <b>PSO 4</b> | <b>PSO 5</b> | <b>PSO 6</b> |
|--------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>CO1</b>                                             | 3            | 3            | 2            | 3            | 3            | 3            |
| <b>CO2</b>                                             | 3            | 2            | 2            | 3            | 3            | 3            |
| <b>CO3</b>                                             | 3            | 3            | 2            | 3            | 3            | 3            |
| <b>CO4</b>                                             | 3            | 2            | 2            | 3            | 3            | 3            |
| <b>CO5</b>                                             | 3            | 2            | 2            | 3            | 3            | 3            |
| <b>Weightage of course<br/>contributed to each PSO</b> | 15           | 12           | 10           | 15           | 15           | 15           |

**Strong-3      M-Medium-2   L-Low-1**

## SKILL ENHANCEMENT COURSE VII: ADVANCE EXCEL-LAB

| Subject Code        | L                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | T | P | Semester | Credits | Inst. Hours | Total Marks |          |              |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|--------------|
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |   |          |         |             | CIA         | External | Total        |
| 26USITP5            | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0 | 2 | IV       | 2       | 2           | 50          | 50       | 100          |
| Learning Objectives |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |   |          |         |             |             |          |              |
| LO1                 | To handle large amounts of data.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |   |          |         |             |             |          |              |
| LO2                 | To aggregate numeric data and summarize into categories and subcategories.                                                                                                                                                                                                                                                                                                                                                                                                                  |   |   |          |         |             |             |          |              |
| LO3                 | To perform filtering, sorting, and grouping of data or subsets of data.                                                                                                                                                                                                                                                                                                                                                                                                                     |   |   |          |         |             |             |          |              |
| LO4                 | To create Pivot Tables to consolidate data from multiple files                                                                                                                                                                                                                                                                                                                                                                                                                              |   |   |          |         |             |             |          |              |
| LO5                 | To present data in the form of charts and graphs.                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |   |          |         |             |             |          |              |
| EX.NO               | Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   |   |          |         |             |             |          | No. of Hours |
| 1                   | <b>Logical Operations</b> – Consider the design of a light switch system that can turn the same light on or off in three different places. One switch (A) is installed in the hall on the first floor, another switch (B) on the upstairs landing, and the third switch (C) on the ground floor. Each switch has two states (ON/OFF). When an odd number of switches are ON, the bulb remains OFF; otherwise, the bulb glows. Design a truth table and find the various states of the bulb. |   |   |          |         |             |             |          | 4            |
| 2                   | Given the name, gender, attendance, assignment, midterm and final grades of five students, find the total assessment marks. Students pass if the total score $\geq 50$ . Display “Pass” or “Fail” in the Description column.                                                                                                                                                                                                                                                                |   |   |          |         |             |             |          | 4            |
| 3                   | Create worksheet with columns Full Name, Last Name, First Name and E-Mail. Using text functions, extract Last Name, First Name and generate E-mail (LastName_FirstName@gmail.com).                                                                                                                                                                                                                                                                                                          |   |   |          |         |             |             |          | 4            |
| 4                   | Use Date and Time functions: DATE, DATEVALUE, DAY, DAYS, MINUTE, MONTH.                                                                                                                                                                                                                                                                                                                                                                                                                     |   |   |          |         |             |             |          | 4            |
| 5                   | <b>Data Validation</b> – Create Excel table with columns Emp Name, Emp No, Salary, Bonus, Date of Entry, Department. Apply rules: Emp No = 5 characters; Salary range 600–2000; Bonus $\leq 10\%$ salary; Date of entry = Today; Department from list.                                                                                                                                                                                                                                      |   |   |          |         |             |             |          | 4            |

|                 |                                                                                                                                                                                                                                            |    |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 6               | <b>Sorting and Filtering</b> – Create Excel table with Course, Level, Instructor Name, Day, Start Time, Duration, Course Fee. Sort by Course Level → Start Time → Course Fee. Filter: Instructor specific, Day = Monday, Time after 17:00. | 4  |
| 7               | Create Column, Line, Bar, Pie and Scatter charts for marks of six semesters.                                                                                                                                                               | 3  |
| 8               | Share chart with Word and PowerPoint.                                                                                                                                                                                                      | 3  |
| TOTAL HOURS     |                                                                                                                                                                                                                                            | 30 |
| CO              | Course Outcomes                                                                                                                                                                                                                            |    |
| CO1             | Perform logical operations.                                                                                                                                                                                                                |    |
| CO2             | Apply Excel functions.                                                                                                                                                                                                                     |    |
| CO3             | Perform data validation.                                                                                                                                                                                                                   |    |
| CO4             | Perform sorting and filtering.                                                                                                                                                                                                             |    |
| CO5             | Create charts and share outputs.                                                                                                                                                                                                           |    |
| Text Books      |                                                                                                                                                                                                                                            |    |
| 1               | Excel 2019 All                                                                                                                                                                                                                             |    |
| 2               | MicrosoftExcel2019PivotTableData Crunching                                                                                                                                                                                                 |    |
| Reference Books |                                                                                                                                                                                                                                            |    |
| 1               | Excel2019All-in-OneforDummies,GregHarvey,1st edition                                                                                                                                                                                       |    |
| Web Resources   |                                                                                                                                                                                                                                            |    |
| 1.              | <a href="https://www.simplilearn.com">https://www.simplilearn.com</a>                                                                                                                                                                      |    |
| 2               | <a href="https://www.javatpoint.com">https://www.javatpoint.com</a>                                                                                                                                                                        |    |
| 3               | <a href="https://www.w3schools.com">https://www.w3schools.com</a>                                                                                                                                                                          |    |

**Mapping Table:**

| CO/ PSO    | PSO 1    | PSO 2    | PSO 3    | PSO 4    | PSO 5    | PSO 6    |
|------------|----------|----------|----------|----------|----------|----------|
| <b>CO1</b> | <b>3</b> | <b>3</b> | <b>2</b> | <b>3</b> | <b>3</b> | <b>3</b> |
| <b>CO2</b> | <b>3</b> | <b>2</b> | <b>2</b> | <b>3</b> | <b>3</b> | <b>3</b> |
| <b>CO3</b> | <b>3</b> | <b>3</b> | <b>2</b> | <b>3</b> | <b>3</b> | <b>3</b> |
| <b>CO4</b> | <b>3</b> | <b>2</b> | <b>2</b> | <b>3</b> | <b>3</b> | <b>3</b> |

|                                                |    |    |    |    |    |    |
|------------------------------------------------|----|----|----|----|----|----|
| CO5                                            | 3  | 2  | 2  | 3  | 3  | 3  |
| Weightage of course<br>contributed to each PSO | 15 | 12 | 10 | 15 | 15 | 15 |

Strong-3      M-Medium-2   L-Low-1

## COMMON - VALUE BASED EDUCATION

| Subject Code        | L                                                                                                                                                                                                                                                                                                   | T | P | Semester | Credits | Inst. Hours | Total Marks |              |       |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|--------------|-------|
|                     |                                                                                                                                                                                                                                                                                                     |   |   |          |         |             | CIA         | External     | Total |
| 26UVBE41            | 2                                                                                                                                                                                                                                                                                                   | 0 | 0 | IV       | 2       | 2           | 50          | 50           | 100   |
| Learning Objectives |                                                                                                                                                                                                                                                                                                     |   |   |          |         |             |             |              |       |
| LO1                 | To provide basic knowledge of the Indian Constitution and its framework.                                                                                                                                                                                                                            |   |   |          |         |             |             |              |       |
| LO2                 | To understand fundamental rights, duties, and directive principles.                                                                                                                                                                                                                                 |   |   |          |         |             |             |              |       |
| LO3                 | To create awareness about human rights and their protection mechanisms.                                                                                                                                                                                                                             |   |   |          |         |             |             |              |       |
| LO4                 | To develop analytical skills regarding constitutional and human rights issues.                                                                                                                                                                                                                      |   |   |          |         |             |             |              |       |
| LO5                 | To promote values of equality, justice, and democracy among students.                                                                                                                                                                                                                               |   |   |          |         |             |             |              |       |
|                     |                                                                                                                                                                                                                                                                                                     |   |   |          |         |             |             |              |       |
| Unit                | Contents                                                                                                                                                                                                                                                                                            |   |   |          |         |             |             | No. of Hours |       |
| I                   | <b>Introduction to Indian Constitution</b><br><b>Introduction:</b> Meaning and importance of Constitution - Historical background of Indian Constitution - Making of the Constitution (Constituent Assembly) - Salient features of Indian Constitution - Preamble – Meaning, Objectives and Values. |   |   |          |         |             |             | 6            |       |
| II                  | <b>Fundamental Rights and Duties</b><br>Fundamental Rights – Types and significance - Right to Equality, Freedom, Religion, Cultural & Educational Rights - Right to Constitutional Remedies - Fundamental Duties – Meaning and importance.                                                         |   |   |          |         |             |             | 6            |       |
| III                 | <b>Directive Principles of State Policy</b><br>Meaning and objectives - Classification of Directive Principles - Relationship between Fundamental Rights and DPSP - Role in governance and welfare state.                                                                                           |   |   |          |         |             |             | 6            |       |
| IV                  | <b>Human Rights – Concepts and Development</b><br>Meaning and definition of Human Rights - Evolution of Human Rights - Universal Declaration of Human Rights (UDHR) - Types of Human Rights – Civil, Political, Economic, Social & Cultural                                                         |   |   |          |         |             |             | 6            |       |

|                 |                                                                                                                                                                                                                                                                                          |    |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| V               | <b>Human Rights in India</b><br><br>Human Rights Protection Act, 1993 - National Human Rights Commission (NHRC) – Structure and functions - Role of NGOs in Human Rights protection - Issues: Women, Children, Minorities & Environment - Contemporary Human Rights challenges in India. | 6  |
| TOTAL HOURS     |                                                                                                                                                                                                                                                                                          | 30 |
| CO              | Course Outcomes                                                                                                                                                                                                                                                                          |    |
| CO1             | Explain the structure and features of the Indian Constitution.                                                                                                                                                                                                                           |    |
| CO2             | Identify and interpret Fundamental Rights and Duties.                                                                                                                                                                                                                                    |    |
| CO3             | Analyze the role of Directive Principles in governance.                                                                                                                                                                                                                                  |    |
| CO4             | Understand the concept and importance of Human Rights.                                                                                                                                                                                                                                   |    |
| CO5             | To create a congenial climate in the organization                                                                                                                                                                                                                                        |    |
| Text Books      |                                                                                                                                                                                                                                                                                          |    |
| 1               | Durga Das Basu – Introduction to the Constitution of India                                                                                                                                                                                                                               |    |
| Reference Books |                                                                                                                                                                                                                                                                                          |    |
| 1               | V.N. Shukla – Constitution of India                                                                                                                                                                                                                                                      |    |
| 2               | M. Laxmikanth – Indian Polity                                                                                                                                                                                                                                                            |    |
| 3               | Upendra Baxi – The Future of Human Rights                                                                                                                                                                                                                                                |    |
| 4               | H.O. Agarwal – Human Rights                                                                                                                                                                                                                                                              |    |
| 5               | P.M. Bakshi – The Constitution of India                                                                                                                                                                                                                                                  |    |

**Mapping Table:**

| <b>CO/PSO</b>                                      | <b>PSO 1</b> | <b>PSO 2</b> | <b>PSO 3</b> | <b>PSO 4</b> | <b>PSO 5</b> | <b>PSO 6</b> |
|----------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>CO1</b>                                         | <b>3</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO2</b>                                         | <b>2</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO3</b>                                         | <b>2</b>     | <b>3</b>     | <b>3</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO4</b>                                         | <b>2</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     |
| <b>CO5</b>                                         | <b>3</b>     | <b>3</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     | <b>2</b>     |
| <b>Weightage of course contributed to each PSO</b> | <b>12</b>    | <b>14</b>    | <b>11</b>    | <b>11</b>    | <b>10</b>    | <b>10</b>    |

# Semester-V

### SEMESTER V – CORE COURSE IX: DATABASE SYSTEMS

| Subject Code               | L                                                                                                                                                                                                                                                                                                                                                                                                                                                 | T | P | Semester | Credits | Inst. Hours | Total Marks |                    |       |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|--------------------|-------|
|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             | CIA         | External           | Total |
| 26UCIT51                   | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0 | 0 | V        | 4       | 5           | 50          | 50                 | 100   |
| <b>Learning Objectives</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             |             |                    |       |
| <b>LO1</b>                 | To understand the basic concepts of databases, DBMS, and their architecture.                                                                                                                                                                                                                                                                                                                                                                      |   |   |          |         |             |             |                    |       |
| <b>LO2</b>                 | To learn the relational model and perform queries using relational algebra.                                                                                                                                                                                                                                                                                                                                                                       |   |   |          |         |             |             |                    |       |
| <b>LO3</b>                 | To design databases using ER and EER models and map them to relational schemas.                                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             |             |                    |       |
| <b>LO4</b>                 | To understand normalization techniques and functional dependencies for database design.                                                                                                                                                                                                                                                                                                                                                           |   |   |          |         |             |             |                    |       |
| <b>LO5</b>                 | To develop skills in SQL and PL/SQL for data manipulation, queries, and database programming.                                                                                                                                                                                                                                                                                                                                                     |   |   |          |         |             |             |                    |       |
| <b>Unit</b>                | <b>Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             |             | <b>No.of Hours</b> |       |
| I                          | Introduction to Databases: Introduction – Characteristics of the Database Approach – Actors on the Scene – Workers behind the scene – Advantages of using DBMS Approach. Overview of database and Architectures: Data Models, Schemas, and Instances – Three-schema Architecture and Data Independence – Database languages & Interfaces – Database System Environment–Centralized& Client Server Architecture for DBMS - Classification of DBMS. |   |   |          |         |             |             | 15                 |       |
| II                         | Basic Relational Model: Relational Model Concepts – Relational Model Constraints and Relational Database Schemas – Update Operations, Tractions, Dealing with Constraint Violations – Formal Relational Languages: Unary Relational Operations: SELECT and PROJECT- Binary Relational Operations: JOIN and DIVISION – Examples of Queries in Relational Algebra.                                                                                  |   |   |          |         |             |             | 15                 |       |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| III                | Conceptual Data Modeling using the ER Model: Using High-Level Conceptual Data Models for Database Design –Entity Types, Entity Sets, Attributes, and Keys– Relationship Types, Relationship sets, Roles, and Structural Constraints – Weak entity types –Naming Convention & Design Issues- Mapping a Conceptual Design into Logical Design: Relational Database Design using ER- Relational Mapping – Mapping EER Model Constructs to Relations                                                                                                                                                                                            | 15        |
| IV                 | Functional Dependencies and Normalization for Relational Database: Functional Dependencies– Definition of Functional Dependency – Normal Forms based on PrimaryKeys–NormalizationofRelations– FirstNormalForm–SecondNormal Form – Third Normal Form– BCNF- Fourth Normal Form- Fifth Normal Form.                                                                                                                                                                                                                                                                                                                                           | 15        |
| V                  | SQL: The Relational Database Standard: Data definition, Constraints, and schema changes in SQL – Basic Queries in SQL – More complex SQL Queries – Insert, delete and update statements in SQL – Views in SQL.PL/SQL: Introduction to PL/SQL – More on PL/SQL – Error Handling in PL/SQL – Oracle_sNamed Exception Handlers – Stored Procedures and Functions – Execution of Procedures and Functions – Advantages – Procedures Vs. Functions – Syntax for Creating Procedures and Functions – Deleting a StoredProcedureorFunction– OraclePackages–DatabaseTriggers–TypesOfTriggers–Deleting a Trigger –Raise-Application Error Procedure. | 15        |
| <b>TOTAL HOURS</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>75</b> |
| <b>CO</b>          | <b>Course Outcomes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |
| CO1                | Outline the fundamental RDBMS concepts and PL/SQL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |
| CO2                | Apply database operations, mapping, normalization, SQL, and PL/SQL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |
| CO3                | Analyze the requirements to implement relational database concepts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |
| CO4                | Evaluate the database based on various models and normalization.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |

|                   |                                                                                                                      |
|-------------------|----------------------------------------------------------------------------------------------------------------------|
| CO5               | Design and construct normalized tables and manipulate them effectively using SQL and PL/SQL database objects.        |
| <b>Text Books</b> |                                                                                                                      |
| 1                 | Ramez Elmasri and Shamkant B. Navathe (2014), <i>Database Systems</i> , Sixth Edition, Pearson Education, New Delhi. |

|                        |                                                                                                                                                                                                         |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2                      | Ivan Bayross (2003 Reprint), <i>SQL, PL/SQL – The Programming Language of Oracle</i> , Second Revised Edition, BPB Publications, New Delhi.                                                             |
| <b>Reference Books</b> |                                                                                                                                                                                                         |
| 1.                     | Abraham Silberschatz, Henry F. Korth, S. Sudarshan, <i>Database System Concepts</i> , Tata McGraw Hill Publication, 4 <sup>th</sup> Edition.                                                            |
| <b>Web Resources</b>   |                                                                                                                                                                                                         |
| 1.                     | <a href="http://srikanthtechnologies.com/books/orabook/ch1.pdf">http://srikanthtechnologies.com/books/orabook/ch1.pdf</a>                                                                               |
| 2.                     | <a href="Http://www.tmv.edu.in/pdf/Distance_education/BCA%20Books/BCA%20IV%20SEM/BCA-428%20Oracle.pdf">Http://www.tmv.edu.in/pdf/Distance_education/BCA%20Books/BCA%20IV%20SEM/BCA-428%20Oracle.pdf</a> |
| 3.                     | <a href="http://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm">http://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm</a>                                                                         |
| 4.                     | <a href="http://ecomputernotes.com/database-system/rdbms">http://ecomputernotes.com/database-system/rdbms</a>                                                                                           |
| 5.                     | <a href="http://www.mithunashok.com/2011/04/basics-of-rdbms.html">http://www.mithunashok.com/2011/04/basics-of-rdbms.html</a>                                                                           |

#### Mapping Table:

| CO/PSO                                             | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                | 3         | 2         | 2         | 3         | 3         | 3         |
| CO2                                                | 3         | 3         | 2         | 3         | 3         | 3         |
| CO3                                                | 3         | 3         | 3         | 3         | 3         | 2         |
| CO4                                                | 3         | 3         | 2         | 3         | 3         | 3         |
| CO5                                                | 3         | 3         | 2         | 3         | 3         | 2         |
| <b>Weightage of course contributed to each PSO</b> | <b>15</b> | <b>14</b> | <b>11</b> | <b>15</b> | <b>15</b> | <b>13</b> |

**Strong-3      M-Medium-2   L-Low-1**

### CORE COURSE X: MACHINE LEARNING

| Subject Code               | L                                                                                                   | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|----------------------------|-----------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|-------|
|                            |                                                                                                     |   |   |          |         |             | CIA         | External | Total |
| 26UCIT52                   | 5                                                                                                   | 0 | 0 | V        | 4       | 5           | 50          | 50       | 100   |
| <b>Learning Objectives</b> |                                                                                                     |   |   |          |         |             |             |          |       |
| <b>LO1</b>                 | To understand the basic concepts and applications of Machine Learning.                              |   |   |          |         |             |             |          |       |
| LO2                        | To learn supervised learning methods, including classification and regression.                      |   |   |          |         |             |             |          |       |
| LO3                        | To understand parametric and nonparametric methods for data analysis.                               |   |   |          |         |             |             |          |       |
| LO4                        | To study neural networks and advanced learning techniques like ensemble and reinforcement learning. |   |   |          |         |             |             |          |       |
| LO5                        | To apply Machine Learning algorithms using Python for real-world applications.                      |   |   |          |         |             |             |          |       |

| Unit | Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | No. of Hours |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| I    | <b>Introduction:</b> Machine Learning – Examples of Machine Learning Applications. <b>Supervised Learning:</b> Learning a Class from Examples – Vapnik- Chervonenkis (VC) Dimension – Probably Approximately Correct (PAC) Learning – Noise – Learning Multiple Classes – Regression – Model Selection and Generalization – Dimensions of a Supervised Machine Learning Algorithm. <b>Bayesian Decision Theory:</b> Introduction – Classification–LossesandRisks–DiscriminantFunctions–AssociationRules. | 15           |
| II   | <b>Parametric Methods:</b> Maximum Likelihood Estimation – Evaluating an Estimator: Bias and Variance – The Bayes' Estimator – Parametric Classification – Regression – Tuning Model Complexity: Bias/Variance Dilemma – Model Selection Procedures. <b>Nonparametric Methods:</b> Nonparametric Density Estimation – Generalization to Multivariate Data – Nonparametric Classification – Condensed Nearest Neighbor – Distance- Based Classification–Outlier Detection.                                | 15           |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| III                | Linear Discrimination – Generalizing the Linear Model – Geometry of the Linear Discriminant – Pairwise Separation – Gradient Descent – Logistic Discrimination – Discrimination by Regression – Learning to Rank. Multilayer Perceptrons: The Perceptron – Training a Perceptron – Learning Boolean Functions – Multilayer Perceptrons – MLP as a Universal Approximator – Back propagation Algorithm.                                       | 15        |
| IV                 | <b>Combining Multiple Learners:</b> Generating Diverse Learners – Model Combination Schemes – Voting – Bagging – Boosting – Stacked Generalization – Fine-Tuning an Ensemble – Cascading Reinforcement Learning: Elements of Reinforcement Learning–Model-Based Learning–Temporal Difference Learning.                                                                                                                                       | 15        |
| V                  | <b>Machine Learning with Python:</b> Data Pre-processing, Analysis & Visualization - Training Data and Test Data – Techniques – Algorithms: List of Common Machine Learning Algorithms- Decision Tree Algorithm- Naïve Bayes Algorithm - K-Means-Random Forest-Dimensionality Reduction Algorithm- Boosting Algorithms – Applications: Social Media-Refinement of Search Engine Results- Product Recommendations-Detection of Online frauds. | 15        |
| <b>TOTAL HOURS</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>75</b> |
| <b>CO</b>          | <b>Course Outcomes</b>                                                                                                                                                                                                                                                                                                                                                                                                                       |           |
| CO1                | Outline the importance of machine learning in terms of designing intelligent machines.                                                                                                                                                                                                                                                                                                                                                       |           |
| CO2                | Identify suitable machine learning techniques for real-time applications.                                                                                                                                                                                                                                                                                                                                                                    |           |
| CO3                | Analyze the theoretical concepts and how they relate to the practical aspects of machine learning.                                                                                                                                                                                                                                                                                                                                           |           |

|                   |                                                                                                                      |
|-------------------|----------------------------------------------------------------------------------------------------------------------|
| CO4               | Assess the significance of principles, algorithms, and applications of machine learning through a hands-on approach. |
| CO5               | Compare machine learning techniques with respective functionality.                                                   |
| <b>Text Books</b> |                                                                                                                      |

|                        |                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                      | Ethem Alpaydın,—Introduction to Machine Learning Third Edition,MIT,2014.(Unit I – Unit IV)<br><a href="https://www.tutorialspoint.com/machine_learning_with_python/machine_learning_with_python_tutorial.pdf">https://www.tutorialspoint.com/machine_learning_with_python/machine_learning_with_python_tutorial.pdf</a> ( <b>UnitV</b> :Machine learning with python tutorial) |
| <b>Reference Books</b> |                                                                                                                                                                                                                                                                                                                                                                                |
| 1                      | Bertt Lantz," Machine LearningwithR,"PacktPublishing,2013                                                                                                                                                                                                                                                                                                                      |
| 2                      | Jason Bell," Machine Learning: Hands-On for Developers and Technical Professionals,"WileyPublication,2015.                                                                                                                                                                                                                                                                     |
| <b>Web Resources</b>   |                                                                                                                                                                                                                                                                                                                                                                                |
| 1                      | <a href="https://www.expertsystem.com/machine-learning-definition/">https://www.expertsystem.com/machine-learning-definition/</a>                                                                                                                                                                                                                                              |
| 2.                     | <a href="https://searchenterpriseai.techtarget.com/definition/machine-learning-ML">https://searchenterpriseai.techtarget.com/definition/machine-learning-ML</a>                                                                                                                                                                                                                |

**Mapping Table:**

| CO/PSO                                             | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                | 3         | 2         | 2         | 2         | 2         | 2         |
| CO2                                                | 2         | 3         | 3         | 3         | 3         | 2         |
| CO3                                                | 2         | 2         | 3         | 3         | 3         | 3         |
| CO4                                                | 3         | 2         | 2         | 3         | 2         | 3         |
| CO5                                                | 3         | 3         | 3         | 2         | 3         | 3         |
| <b>Weightage of course contributed to each PSO</b> | <b>13</b> | <b>12</b> | <b>13</b> | <b>13</b> | <b>13</b> | <b>13</b> |

**Strong-3      M-Medium-2   L-Low-1**

## CORE COURSE XI : DATABASE SYSTEMS LAB

| Subject Code        | L                                                                                | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|---------------------|----------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|-------|
|                     |                                                                                  |   |   |          |         |             | CIA         | External | Total |
| 26UCITP5            | 0                                                                                | 0 | 5 | V        | 4       | 5           | 50          | 50       | 100   |
| Learning Objectives |                                                                                  |   |   |          |         |             |             |          |       |
| LO1                 | To understand SQL commands such as DDL, DML, and DCL.                            |   |   |          |         |             |             |          |       |
| LO2                 | To learn SQL queries including joins, subqueries, and aggregate functions.       |   |   |          |         |             |             |          |       |
| LO3                 | To use built-in SQL functions for data manipulation and retrieval.               |   |   |          |         |             |             |          |       |
| LO4                 | To develop basic programs using PL/SQL.                                          |   |   |          |         |             |             |          |       |
| LO5                 | To understand procedures, functions, triggers, and exception handling in PL/SQL. |   |   |          |         |             |             |          |       |
| Contents            |                                                                                  |   |   |          |         |             |             |          |       |

---

**SQL:**

1. DDL Commands
2. DML Commands
3. DCL Commands
4. SQL Built-in functions
5. Using Sub Queries
6. Inner Join Example
7. Aggregate with GROUP BY
8. Subquery Example

## PL/SQL:

9. Simple programs using PL/SQL
10. Procedures
11. User-defined functions
12. Exception Handling
13. Triggers

|                    |                        |           |
|--------------------|------------------------|-----------|
| <b>TOTAL HOURS</b> |                        | <b>75</b> |
| <b>CO</b>          | <b>Course Outcomes</b> |           |

|     |                                                                                  |
|-----|----------------------------------------------------------------------------------|
| CO1 | Choose appropriate SQL queries and PL/SQL blocks for the database.               |
| CO2 | Implement SQL and PL/SQL blocks for the given problem effectively.               |
| CO3 | Analyze the problem and exceptions using queries and PL/SQL blocks.              |
| CO4 | Validate the database for normalization using SQL and PL/SQL blocks.             |
| CO5 | Design database tables; create procedures, user-defined functions, and triggers. |

**Mapping Table:**

| CO/PSO                                             | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|----------------------------------------------------|------|------|------|------|------|------|
| CO1                                                | 2    | 2    | 2    | 3    | 3    | 2    |
| CO2                                                | 3    | 3    | 2    | 3    | 2    | 3    |
| CO3                                                | 2    | 3    | 3    | 3    | 2    | 3    |
| CO4                                                | 2    | 3    | 2    | 3    | 3    | 3    |
| CO5                                                | 2    | 2    | 2    | 3    | 3    | 2    |
| Weightage of the course<br>contributed to each PSO | 11   | 13   | 11   | 15   | 13   | 13   |

**Strong-3      M-Medium-2   L-Low-1**

## CORE COURSE XII: MACHINE LEARNING LAB

| Subject Code | L | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|--------------|---|---|---|----------|---------|-------------|-------------|----------|-------|
|              |   |   |   |          |         |             | CIA         | External | Total |
| 26UCITP6     | 0 | 0 | 5 | V        | 4       | 5           | 50          | 50       | 100   |

### Learning Objectives

|     |                                                              |
|-----|--------------------------------------------------------------|
| LO1 | To get the knowledge to write programs for machine learning. |
| LO2 | To understand the usage of functions                         |

|     |                                                                  |
|-----|------------------------------------------------------------------|
| LO3 | To understand the usage of plotting methods                      |
| LO4 | To understand the application of various components and datasets |
| LO5 | To understand the usage of classification and segmentation       |

### Contents

1. Write a Python program to load data from a given CSV file into a Data Frame and print the shape of the data, data types, and first three rows.
2. Write a Python program to get the number of observations, missing values, and NaN values from a dataset.
3. Write a Python program to view basic statistical details such as percentiles, mean, standard deviation, etc., of a given dataset.
4. Write a Python program to split a dataset into its attributes (X) and labels (y).
5. Write a program to implement the Naïve Bayesian classifier for a sample training dataset stored as a CSV file and compute the accuracy of the classifier using test datasets.
6. Write a program to implement the k-Nearest Neighbour algorithm to classify a dataset and print both correct and wrong predictions.
7. Implement linear regression with one variable on any dataset.
8. Represent a scatter plot using any two variables of a dataset.
9. Use an appropriate dataset to build a decision tree and apply it to classify a new sample.
10. Apply K-Means clustering on a dataset.

### TOTAL HOURS

75

| CO  | Course Outcomes                        |
|-----|----------------------------------------|
| CO1 | Apply the basics of machine learning   |
| CO2 | Implement the components with datasets |

|     |                                           |
|-----|-------------------------------------------|
| CO3 | Use different classifiers                 |
| CO4 | Apply different segmentation methods      |
| CO5 | Display various applications using Python |

**Mapping Table:**

| CO/PSO                                             | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                | 3         | 2         | 3         | 3         | 2         | 2         |
| CO2                                                | 3         | 3         | 3         | 3         | 2         | 2         |
| CO3                                                | 3         | 3         | 3         | 2         | 2         | 3         |
| CO4                                                | 3         | 3         | 3         | 3         | 3         | 2         |
| CO5                                                | 3         | 3         | 2         | 3         | 2         | 2         |
| <b>Weightage of course contributed to each PSO</b> | <b>15</b> | <b>14</b> | <b>14</b> | <b>14</b> | <b>11</b> | <b>11</b> |

**Strong-3      M-Medium-2      L-Low-1**

## ELECTIVE V A: COMPUTER NETWORKS

| Subject Code        | L                                                                                                                                                                                                                                                                                                                    | T | P | Semester | Credits | Inst. Hours | Marks |          |              |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------|----------|--------------|
|                     |                                                                                                                                                                                                                                                                                                                      |   |   |          |         |             | CIA   | External | Total        |
| 26UEIT51            | 4                                                                                                                                                                                                                                                                                                                    | 0 | 0 | V        | 3       | 4           | 50    | 50       | 100          |
| Learning Objectives |                                                                                                                                                                                                                                                                                                                      |   |   |          |         |             |       |          |              |
| LO1                 | To understand the basic concepts of data communication, networks, and network models.                                                                                                                                                                                                                                |   |   |          |         |             |       |          |              |
| LO2                 | To learn data transmission techniques, signals, and different transmission media.                                                                                                                                                                                                                                    |   |   |          |         |             |       |          |              |
| LO3                 | To study switching techniques, error detection, and data link control protocols.                                                                                                                                                                                                                                     |   |   |          |         |             |       |          |              |
| LO4                 | To understand network devices, LAN technologies, and IP addressing (IPv4 & IPv6).                                                                                                                                                                                                                                    |   |   |          |         |             |       |          |              |
| LO5                 | To learn routing, application layer concepts, and modern technologies like 5G and IoT.                                                                                                                                                                                                                               |   |   |          |         |             |       |          |              |
| Unit                | Contents                                                                                                                                                                                                                                                                                                             |   |   |          |         |             |       |          | No. of Hours |
| I                   | <b>Introduction:</b><br>Data Communication – Networks – Distributed Processing – Network Criteria – Physical Structures – Network Models – Categories of Network – Internetwork-The Internet. Protocols and Standards – Network Models – Layers in the OSI Model – TCP/IP Protocol Suite.                            |   |   |          |         |             |       |          | 12           |
| II                  | Data and Signals: Analog and Digital Data - Analog and Digital Signals –Digital Signal. Digital Transmission:–Digital-to-digital Conversion, Analog-to-Digital Conversion, Transmission Modes. Transmission Media: Guided media - Unguided Media.                                                                    |   |   |          |         |             |       |          | 12           |
| III                 | Switching: Circuit Switched Networks - Datagram Networks-Virtual Circuit Network - Error Detection and Correction: Introduction - Block Coding - Linear Block Codes – Cyclic Codes: Cyclic Redundancy Check - Checksum. Data Link Control:Framing-FlowControlandErrorControl-NoiselessChannel:Stop-and-waitProtocol. |   |   |          |         |             |       |          | 12           |

|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| IV              | Wired LANs: Standard Ethernet-GIGABIT Ethernet-Wireless LAN: Bluetooth Connecting LANs: Connecting Devices: Passive Hubs-Repeaters-Active Hubs- Bridges-TwoLayerSwitches-Routers-ThreelayerSwitches-Gateway-Network Layer: Internet Protocol: IPv4–Ipv6-TransitionfromIPv4to IPv6.                                                                                                                                                                                                                                       | 12 |
| V               | Network Layer: Delivery, Forwarding and Routing- Unicast Routing Protocols: Distance Vector Routing-Link state routing- Multicast Routing Protocols. Application Layer: Domain Name Svstem- Namespace , Domain Name Space , DNS in the Internet . 5G Network: Salient Features-Technology-Applications-Advanced Features- Advantages & Disadvantages-Internet of Things: key Features Advantages & Disadvantages-IOT Hardware- IOT Technology and Protocols-IOT Common Uses-Applications- WiFi-WiMax Lifi- Lifi vs Wifi. | 12 |
| TOTAL HOURS     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 60 |
| CO              | Course Outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| CO1             | Understand the fundamental concepts of computer networks and their application areas.                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| CO2             | Identify and use various networking techniques and components to establish networking connections and transmission.                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| CO3             | Analyze the services performed by different network layers and recent advancements in networking.                                                                                                                                                                                                                                                                                                                                                                                                                        |    |
| CO4             | Compare various networking models, layers, protocols, and technologies.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
| CO5             | Select appropriate networking mechanisms to build a reliable network.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| Text Books      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| 1.              | Behrouz and Forouzan,(2006),Data Communication and Networking,4thEdition,TMH.                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
| 2.              | Ajit Pal,(2014),Data Communication and Computer Networks, PHI.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| Reference Books |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| 1               | Jean Walrand(1998),—Communication Networks, Second Edition ,Tata Mc Graw Hill.                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| Web Resources   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| 1               | http://www.tutorialspoint.com/data_communication_computer_network/                                                                                                                                                                                                                                                                                                                                                                                                                                                       |    |

|   |                                                                                                                                                                         |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 | <a href="http://www.slideshare.net/zafar_ayub/data-communication-and-network-11903853">http://www.slideshare.net/zafar_ayub/data-communication-and-network-11903853</a> |
| 3 | <a href="http://www.freetchbooks.com/data-communication-and-networks-f31.html">http://www.freetchbooks.com/data-communication-and-networks-f31.html</a>                 |

**Mapping Table:**

| <b>CO/PSO</b>                                          | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> |
|--------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                                             | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    |
| <b>CO2</b>                                             | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    |
| <b>CO3</b>                                             | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    |
| <b>CO4</b>                                             | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    |
| <b>CO5</b>                                             | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>15</b>   | <b>14</b>   | <b>11</b>   | <b>15</b>   | <b>15</b>   | <b>10</b>   |

**Strong-3**

**M-Medium-2**

**L-Low-1**

### ELECTIVE V B: DATA MINING

| Subject Code        | L                                                                                                                                                                                                                                                                                                                                                       | T | P | Semester | Credits | Inst. Hours | Total Marks |              |       |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|--------------|-------|
|                     |                                                                                                                                                                                                                                                                                                                                                         |   |   |          |         |             | CIA         | External     | Total |
| 26UEIT52            | 4                                                                                                                                                                                                                                                                                                                                                       | 0 | 0 | V        | 3       | 4           | 50          | 50           | 100   |
| Learning Objectives |                                                                                                                                                                                                                                                                                                                                                         |   |   |          |         |             |             |              |       |
| LO1                 | To understand the basic concepts of data mining, data types, and preprocessing techniques.                                                                                                                                                                                                                                                              |   |   |          |         |             |             |              |       |
| LO2                 | To learn association rule mining and frequent pattern discovery methods.                                                                                                                                                                                                                                                                                |   |   |          |         |             |             |              |       |
| LO3                 | To study classification techniques such as decision trees, Bayesian methods, and logistic regression.                                                                                                                                                                                                                                                   |   |   |          |         |             |             |              |       |
| LO4                 | To understand clustering methods like K-means, hierarchical clustering, and DBSCAN.                                                                                                                                                                                                                                                                     |   |   |          |         |             |             |              |       |
| LO5                 | To learn outlier detection and data visualization techniques for analyzing data.                                                                                                                                                                                                                                                                        |   |   |          |         |             |             |              |       |
| Unit                | Contents                                                                                                                                                                                                                                                                                                                                                |   |   |          |         |             |             | No. of Hours |       |
| I                   | <b>Introduction:</b> Data Mining – Kinds of Data and Patterns to be Mined – Technologies used –Kinds of Applications are Targeted - Major Issues – Data objects and Attribute types – Basic statistical Descriptions of Data-<br><b>Data Preprocessing :</b> Data Cleaning–Data Integration-Data Reduction-Data Transformation and Data Discretization. |   |   |          |         |             |             | 12           |       |
| II                  | <b>Association Rules Mining:</b> Introduction – Frequent Item set Mining Methods: Apriori Algorithm-Generating Association Rules from Frequent Itemsets- Improving the efficiency of Apriori -A Pattern–Growth Approach for mining Frequent Item sets-Pattern Evaluation Methods.                                                                       |   |   |          |         |             |             | 12           |       |
| III                 | <b>Classification:</b> Introduction –Basic concepts – Logistic regression - Decision tree induction–Bayesian classification, Rule–as declassification –Model Evaluation and selection.                                                                                                                                                                  |   |   |          |         |             |             | 12           |       |
| IV                  | <b>Cluster Analysis:</b> Introduction-Requirements for Cluster Analysis - <b>Partitioning Methods:</b> The K-Means method - <b>Hierarchical Method:</b> Agglomerative method– <b>Density based methods :</b> DBSCAN-                                                                                                                                    |   |   |          |         |             |             | 12           |       |

|                        |                                                                                                                                                                                                                                                                                    |           |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                        | <b>Evaluation of Clustering</b> :Determining the Number of Clusters–<br>Measuring Clustering Quality.                                                                                                                                                                              |           |
| V                      | <b>Outlier Detection:</b> Outliers and Outlier Analysis – Outlier Detection<br>Methods - <b>Data Visualization:</b> Pixel-oriented visualization – Geometric<br>Projection visualization technique-Icon-based-<br>Hierarchicalvisualization-Visualizingcomplex data and relations. | 12        |
| <b>TOTAL HOURS</b>     |                                                                                                                                                                                                                                                                                    | <b>60</b> |
| <b>CO</b>              | <b>Course Outcomes</b>                                                                                                                                                                                                                                                             |           |
| CO1                    | Outline the fundamentals and principles of data mining.                                                                                                                                                                                                                            |           |
| CO2                    | Apply suitable pre processing techniques for data mining.                                                                                                                                                                                                                          |           |
| CO3                    | Classify data mining techniques based on different applications.                                                                                                                                                                                                                   |           |
| CO4                    | Analyze various data mining algorithms with respect to their functionality.                                                                                                                                                                                                        |           |
| CO5                    | Recommend appropriate data models for data mining techniques to solve real-world<br>problems.                                                                                                                                                                                      |           |
| <b>Text Books</b>      |                                                                                                                                                                                                                                                                                    |           |
| 1                      | Jiawei Han, Micheline Kamber, Jian Pei, <i>Data Mining: Concepts and Techniques</i> , 3rd<br>Edition, Elsevier, 2012.                                                                                                                                                              |           |
| <b>Reference Books</b> |                                                                                                                                                                                                                                                                                    |           |
| 1.                     | Ian H. Witten and Eibe Frank, <i>Data Mining: Practical Machine Learning Tools and<br/>Techniques</i> , 2nd Edition, Morgan Kaufmann, 2005.                                                                                                                                        |           |
| 2.                     | Arun K. Pujari, <i>Data Mining Techniques</i> , 10th Impression, University Press, 2008.                                                                                                                                                                                           |           |
| 3.                     | Daniel T. Larose and Chantal D. Larose, <i>Data Mining and Predictive Analytics</i> , 2nd<br>Edition, Wiley, 2015.                                                                                                                                                                 |           |
| 4.                     | G. K. Gupta, <i>Introduction to Data Mining with Case Studies</i> , 2nd Edition, PHI Private<br>Limited, New Delhi, 2011.                                                                                                                                                          |           |
| <b>Web Resources</b>   |                                                                                                                                                                                                                                                                                    |           |
| 1.                     | <a href="http://csed.sggs.ac.in/csedsites/default/files/WEKA%20Explorer%20Tutorial.pdf">http://csed.sggs.ac.in/csedsites/default/files/WEKA%20Explorer%20Tutorial.pdf</a>                                                                                                          |           |
| 2.                     | <a href="https://www.cs.auckland.ac.nz/courses/compsci367s1c/tutorials/IntroductionToWeka.pdf">https://www.cs.auckland.ac.nz/courses/compsci367s1c/tutorials/IntroductionToWeka.pdf</a>                                                                                            |           |

**Mapping Table:**

| <b>CO/PSO</b>                                          | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> |
|--------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                                             | <b>2</b>    | <b>2</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    |
| <b>CO2</b>                                             | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    |
| <b>CO3</b>                                             | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    |
| <b>CO4</b>                                             | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    |
| <b>CO5</b>                                             | <b>3</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>13</b>   | <b>14</b>   | <b>11</b>   | <b>11</b>   | <b>15</b>   | <b>14</b>   |

**Strong-3      M-Medium-2   L-Low-1**

## ELECTIVE VI A: CRYPTOGRAPHY & NETWORK SECURITY

| Subject Code        | L                                                                                                                                                                                                              | T | P | Semester | Credits | Inst. Hours | Total Marks |          |               |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|---------------|
|                     |                                                                                                                                                                                                                |   |   |          |         |             | CIA         | External | Total         |
| 26UEIT53            | 4                                                                                                                                                                                                              | 0 | 0 | V        | 3       | 4           | 50          | 50       | 100           |
| Learning Objectives |                                                                                                                                                                                                                |   |   |          |         |             |             |          |               |
| LO1                 | To understand the fundamentals of cryptography.                                                                                                                                                                |   |   |          |         |             |             |          |               |
| LO2                 | To acquire knowledge of standard algorithms used to provide confidentiality, integrity, and authenticity.                                                                                                      |   |   |          |         |             |             |          |               |
| LO3                 | To understand the various key distribution and management schemes.                                                                                                                                             |   |   |          |         |             |             |          |               |
| LO4                 | To understand how to deploy encryption techniques to secure data in transit across data networks.                                                                                                              |   |   |          |         |             |             |          |               |
| LO5                 | To design security applications in the field of Information Technology.                                                                                                                                        |   |   |          |         |             |             |          |               |
| Unit                | Contents                                                                                                                                                                                                       |   |   |          |         |             |             |          | No. of. Hours |
| I                   | Introduction: The OSI security Architecture–Security Attacks–Security Mechanisms– Security Services–A model for network Security.                                                                              |   |   |          |         |             |             |          | 12            |
| II                  | Classical Encryption Techniques: Symmetric cipher model – Substitution Techniques: Caesar Cipher – Mono alphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography |   |   |          |         |             |             |          | 12            |
| III                 | Block Cipher and DES: Block Cipher Principles–DES The Strength of DES–RSA:The RSA algorithm.                                                                                                                   |   |   |          |         |             |             |          | 12            |
| IV                  | Network Security Practices: IP Security overview - IP Security architecture –Authentication Header. Web Security: Secure Socket Layer and Transport Layer Security– Secure Electronic Transaction.             |   |   |          |         |             |             |          | 12            |
| V                   | Intruders–Malicious software–Firewalls.                                                                                                                                                                        |   |   |          |         |             |             |          | 12            |
| TOTAL HOURS         |                                                                                                                                                                                                                |   |   |          |         |             |             | 60       |               |
| Course Outcomes     |                                                                                                                                                                                                                |   |   |          |         |             |             |          |               |
| CO                  | On completion of this course, students will                                                                                                                                                                    |   |   |          |         |             |             |          |               |
| CO1                 | Analyze the vulnerabilities in any computing system and hence be able to design a security solution.                                                                                                           |   |   |          |         |             |             |          |               |
| CO2                 | Apply the different cryptographic operations of symmetric cryptographic algorithms.                                                                                                                            |   |   |          |         |             |             |          |               |

|                        |                                                                                                                                                           |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO3                    | Apply the different cryptographic operations of public key cryptography.                                                                                  |
| CO4                    | Apply the various Authentication schemes to simulate different applications.                                                                              |
| CO5                    | Understand various Security practices and System security standards                                                                                       |
| <b>Text Books</b>      |                                                                                                                                                           |
| 1                      | <b>William Stallings</b> ,—Cryptography and Network Security Principles and Practices.                                                                    |
| <b>Reference Books</b> |                                                                                                                                                           |
| 1                      | Behrouz A. Forouzan, <i>Cryptography and Network Security</i> , Tata McGraw-Hill, 2007.                                                                   |
| 2                      | Atul Kahate, <i>Cryptography and Network Security</i> , 2nd Edition, Tata McGraw-Hill, 2003.                                                              |
| 3                      | M. V. Arun Kumar, <i>Network Security</i> , 1st Edition, University Science Press, 2011.                                                                  |
| <b>Web Resources</b>   |                                                                                                                                                           |
| 1                      | <a href="https://www.tutorialspoint.com/cryptography/">https://www.tutorialspoint.com/cryptography/</a>                                                   |
| 2                      | <a href="https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography">https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography</a> |

**Mapping Table:**

| CO/PSO                                                 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|--------------------------------------------------------|------|------|------|------|------|------|
| CO 1                                                   | 3    | 3    | 3    | 2    | 3    | 2    |
| CO 2                                                   | 3    | 2    | 3    | 2    | 3    | 3    |
| CO 3                                                   | 3    | 3    | 3    | 2    | 3    | 3    |
| CO 4                                                   | 2    | 3    | 3    | 3    | 2    | 3    |
| CO 5                                                   | 3    | 2    | 3    | 3    | 3    | 3    |
| <b>Weightage of course<br/>contributed to each PSO</b> | 14   | 13   | 15   | 12   | 14   | 14   |

**Strong-3      M-Medium-2      L-Low-1**

## ELECTIVE VIB: ARTIFICIAL INTELLIGENCE

| Subject Code       | L                                                                                                                                                                                                      | T | P | Semester | Credits | Inst. Hours | Total Marks |          |             |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|-------------|
|                    |                                                                                                                                                                                                        |   |   |          |         |             | CIA         | External | Total       |
| 26UEIT54           | 4                                                                                                                                                                                                      | 0 | 0 | V        | 3       | 4           | 50          | 50       | 100         |
| Learning Objective |                                                                                                                                                                                                        |   |   |          |         |             |             |          |             |
| LO1                | To learn various concepts of AI techniques.                                                                                                                                                            |   |   |          |         |             |             |          |             |
| LO2                | To learn various search algorithms in AI.                                                                                                                                                              |   |   |          |         |             |             |          |             |
| LO3                | To learn probabilistic reasoning and models in AI.                                                                                                                                                     |   |   |          |         |             |             |          |             |
| LO4                | To learn about Markov Decision Processes (MDP).                                                                                                                                                        |   |   |          |         |             |             |          |             |
| LO5                | To learn various types of reinforcement learning.                                                                                                                                                      |   |   |          |         |             |             |          |             |
| Unit               | Details                                                                                                                                                                                                |   |   |          |         |             |             |          | No.of Hours |
| I                  | Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree |   |   |          |         |             |             |          | 12          |
| II                 | Search Algorithms : Search with closed and open list, Depth first and Breadth first search, Uniform Cost Search (UCS) Heuristic search, Best first search, A* algorithm, Game Search                   |   |   |          |         |             |             |          | 12          |
| III                | Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.                        |   |   |          |         |             |             |          | 12          |
| IV                 | Markov Decision process: MDP formulation, utility theory, utility functions, value iteration ,policy iteration and partially observable MDPs.                                                          |   |   |          |         |             |             |          | 12          |
| V                  | Reinforcement Learning: Passive reinforcement learning, direct utility Estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.              |   |   |          |         |             |             |          | 12          |
|                    | TOTAL HOURS                                                                                                                                                                                            |   |   |          |         |             |             |          | 60          |
| Course Outcomes    |                                                                                                                                                                                                        |   |   |          |         |             |             |          |             |
| CO                 | On completion of this course, students will be able to:                                                                                                                                                |   |   |          |         |             |             |          |             |

|     |                                                                |
|-----|----------------------------------------------------------------|
| CO1 | Understand the various concepts of AI techniques.              |
| CO2 | Understand various search algorithms in AI.                    |
| CO3 | Understand probabilistic reasoning and models in AI.           |
| CO4 | Understand Markov Decision Processes (MDP).                    |
| CO5 | Understand various types of reinforcement learning techniques. |

#### Text Book

|   |                                                                                                         |
|---|---------------------------------------------------------------------------------------------------------|
| 1 | Stuart Russell and Peter Norvig,—Artificial Intelligence :A Modern Approach,3rd Edition, Prentice Hall. |
| 2 | Elaine Rich and Kevin Knight,—Artificial Intelligence ,TataMcGrawHill                                   |

#### Reference Books

|    |                                                                                                                                |
|----|--------------------------------------------------------------------------------------------------------------------------------|
| 1. | Trivedi,M.C.,—A Classical Approach to Artificial Intelligence, Khanna Publishing House, Delhi.                                 |
| 2. | Saroj Kaushik,—Artificial Intelligence, Cengage Learning India, 2011                                                           |
| 3. | David Poole and Alan Mackworth,—Artificial Intelligence: Foundations for Computational Agents, Cambridge University Press 2010 |

#### Web Resources

|    |                                                                                             |
|----|---------------------------------------------------------------------------------------------|
| 1. | NPTEL & MOOC Courses, <i>Artificial Intelligence and Expert Systems</i> .                   |
| 2. | <a href="https://nptel.ac.in/courses/106106140/">https://nptel.ac.in/courses/106106140/</a> |

#### MAPPING TABLE:

| CO/PSO                                             | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                | 3         | 2         | 3         | 2         | 2         | 2         |
| CO2                                                | 2         | 3         | 3         | 3         | 3         | 2         |
| CO3                                                | 2         | 2         | 3         | 3         | 3         | 3         |
| CO4                                                | 3         | 2         | 2         | 3         | 3         | 3         |
| CO5                                                | 3         | 3         | 3         | 3         | 3         | 3         |
| <b>Weightage of course contributed to each PSO</b> | <b>13</b> | <b>12</b> | <b>14</b> | <b>14</b> | <b>14</b> | <b>13</b> |

**Strong-3**

**M-Medium-2**

**L-Low-1**

## ABILITY ENHANCEMENT COURSE – I: EMPOWERED VOCATIONAL ENGLISH

| Subject Code        | L                                                                                                                                                                                  | T | P | Semester | Credits | Inst. Hours | Total Marks |          |              |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|--------------|
|                     |                                                                                                                                                                                    |   |   |          |         |             | CIA         | External | Total        |
| 26UAEC51            | 2                                                                                                                                                                                  | 0 | 0 | V        | 2       | 2           | 50          | 50       | 100          |
| Learning Objectives |                                                                                                                                                                                    |   |   |          |         |             |             |          |              |
| LO1                 | To build self- assurance in students by mastering interpersonal, team- management, and leadership abilities.                                                                       |   |   |          |         |             |             |          |              |
| LO2                 | To equip aspiring learners with skills that transform them into effective young managers.                                                                                          |   |   |          |         |             |             |          |              |
| LO3                 | To sharpen communication proficiency for professional and workplace contexts.                                                                                                      |   |   |          |         |             |             |          |              |
| LO4                 | To foster strategic thinking and problem- solving through advanced writing & presentation techniques.                                                                              |   |   |          |         |             |             |          |              |
| LO5                 | To develop etiquette and corporate- ready competencies for modern business environments                                                                                            |   |   |          |         |             |             |          |              |
|                     |                                                                                                                                                                                    |   |   |          |         |             |             |          |              |
| Unit                | Contents                                                                                                                                                                           |   |   |          |         |             |             |          | No. of Hours |
| I                   | Communication Skills , Current English Usage , Aptitude and Attitude , Team Building and Leadership , Psychological Tests , Effective Resume Writing                               |   |   |          |         |             |             |          | 6            |
| II                  | Précis Writing, Essay Writing, Goal Setting ,Conflict Management, Appearing for an Interview , Myths regarding Group Discussion                                                    |   |   |          |         |             |             |          | 6            |
| III                 | Debates, Presentation for Small and Large Groups , Prioritization ,Time Management ,Stress Interview , Prerequisites of a Group Discussion                                         |   |   |          |         |             |             |          | 6            |
| IV                  | Marketing and Business Presentations, Report Writing , Cross- Cultural Communication, Lateral Thinking, Qualities of a Candidate for an Interview, Generating Ideas for Discussion |   |   |          |         |             |             |          | 6            |
| V                   | Telephone Etiquette, Email Etiquette, Concepts of Leadership, Insights from Great Leaders, Mock Interview, Mock Group Discussion                                                   |   |   |          |         |             |             |          | 6            |
| TOTAL HOURS         |                                                                                                                                                                                    |   |   |          |         |             |             | 30       |              |
| CO                  | Course Outcomes                                                                                                                                                                    |   |   |          |         |             |             |          |              |
| CO1                 | Students will demonstrate strong interpersonal and leadership skills in team settings.                                                                                             |   |   |          |         |             |             |          |              |
| CO2                 | Learners will apply effective communication strategies in current English usage.                                                                                                   |   |   |          |         |             |             |          |              |
| CO3                 | Graduates will craft professional résumés and master interview- ready writing styles.                                                                                              |   |   |          |         |             |             |          |              |

|                   |                                                                                                                           |
|-------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>CO4</b>        | Participants will manage conflicts, set goals, and deliver impactful presentations.                                       |
| <b>CO5</b>        | Individuals will exhibit polished telephone & email etiquette alongside refined leadership insights                       |
| <b>Text Books</b> |                                                                                                                           |
| 1                 | Covey, Stephen R. _The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change_. Simon & Schuster, 1989. |
| 2                 | Khera, Shiv. _You Can Win: A Step by Step Tool for Top Achievers_. Macmillan, 1998.                                       |

**Mapping Table:**

| <b>CO/PSO</b>                                      | <b>PSO 1</b> | <b>PSO 2</b> | <b>PSO 3</b> | <b>PSO 4</b> | <b>PSO 5</b> | <b>PSO 6</b> |
|----------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>CO1</b>                                         | 3            | 2            | 2            | 2            | 2            | 2            |
| <b>CO2</b>                                         | 2            | 3            | 2            | 2            | 2            | 2            |
| <b>CO3</b>                                         | 2            | 3            | 3            | 3            | 2            | 2            |
| <b>CO4</b>                                         | 2            | 3            | 2            | 2            | 2            | 2            |
| <b>CO5</b>                                         | 3            | 3            | 2            | 2            | 2            | 2            |
| <b>Weightage of course contributed to each PSO</b> | <b>12</b>    | <b>14</b>    | <b>11</b>    | <b>11</b>    | <b>10</b>    | <b>10</b>    |

**Strong-3      M-Medium-2   L-Low-1**

# Semester-VI

**SEMESTER VI – CORE COURSE XIII: SOFTWARE ENGINEERING**

| Subject Code        | L                                                                                                                                                                                                                                                                                                                    | T | P | Semester | Credits | Inst. Hours | Total Marks |          |              |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|--------------|
|                     |                                                                                                                                                                                                                                                                                                                      |   |   |          |         |             | CIA         | External | Total        |
| 26UCIT61            | 4                                                                                                                                                                                                                                                                                                                    | 0 | 0 | VI       | 4       | 4           | 50          | 50       | 100          |
| Learning Objectives |                                                                                                                                                                                                                                                                                                                      |   |   |          |         |             |             |          |              |
| LO1                 | This paper familiarizes the students about the processes, forms, tasks, techniques and tools involved in Software Engineering.                                                                                                                                                                                       |   |   |          |         |             |             |          |              |
| LO2                 | To learn requirements analysis, specification, and management techniques.                                                                                                                                                                                                                                            |   |   |          |         |             |             |          |              |
| LO3                 | To understand software project planning, cost estimation, and risk management.                                                                                                                                                                                                                                       |   |   |          |         |             |             |          |              |
| LO4                 | To study software design principles and testing methods.                                                                                                                                                                                                                                                             |   |   |          |         |             |             |          |              |
| LO5                 | To understand software quality, reliability, and maintenance processes.                                                                                                                                                                                                                                              |   |   |          |         |             |             |          |              |
| Unit                | Contents                                                                                                                                                                                                                                                                                                             |   |   |          |         |             |             |          | No. of Hours |
| I                   | Introduction to Software Engineering: Introduction to Software Engineering: Definition - The changing nature of software -Terminologies - Role of Management in Software Development - Software Life Cycle Models: The Waterfall Model - Increment Process Model - Evolutionary Process Model - The Unified Process. |   |   |          |         |             |             |          | 12           |
| II                  | Software Requirements Analysis and Specifications: Requirements Engineering - Type of Requirements - Feasibility Studies - Requirements Elicitation - Requirements Analysis - Requirements Validation – Requirement Management                                                                                       |   |   |          |         |             |             |          | 12           |
| III                 | Software Project Planning: Size Estimation - Cost Estimation - The Constructive Cost Model (COCOMO) - COCOMO II- Software Risk Management - Software Design: Definition - Modularity - Strategy of Design - Function Oriented Design                                                                                 |   |   |          |         |             |             |          | 12           |
| IV                  | Software Testing: A Strategic Approach to Software Testing – Terminologies – Functional Testing – Structural Testing – Levels of Testing – Validation Testing – Testing Tools.                                                                                                                                       |   |   |          |         |             |             |          | 12           |

|                 |                                                                                                                                                                                                                                                    |    |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| V               | Software Reliability: Basic Concepts – Software Quality – McCall Software Quality Model – Boehm Software Quality Model – Capability Maturity Model – Software Maintenance: Definition – Process Models – Configuration Management – Documentation. | 12 |
| TOTAL HOURS     |                                                                                                                                                                                                                                                    | 60 |
|                 |                                                                                                                                                                                                                                                    |    |
| CO              | Course Outcomes                                                                                                                                                                                                                                    |    |
| CO1             | Define the basic terminologies involved in the entire Software Development Life Cycle (SDLC).                                                                                                                                                      |    |
| CO2             | Identify suitable software development models, techniques, and tools for building an effective software product.                                                                                                                                   |    |
| CO3             | Apply software engineering principles through requirements analysis, software design and construction, verification, and validation to develop solutions for modern real-world problems.                                                           |    |
| CO4             | Compare and contrast different process models, cost models, quality models, and testing techniques used in software development.                                                                                                                   |    |
| CO5             | Estimate project cost using suitable cost estimation models, assess software risks, and evaluate management strategies for effective and successful software development.                                                                          |    |
| Text Books      |                                                                                                                                                                                                                                                    |    |
| 1               | K.KAgarwal,YogeshSingh(2009),—SoftwareEngineeringll,3 <sup>rd</sup> Edition,NewAge International Publishers                                                                                                                                        |    |
| Reference Books |                                                                                                                                                                                                                                                    |    |
| 1               | Roger S. Pressman, Software Engineering – A Practitioner’s Approach, 5th Edition, Tata McGraw-Hill Publishing Company.                                                                                                                             |    |
| 2               | Pankaj Jalote (2005), An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publishing House.                                                                                                                                        |    |
| 3               | Thomas T. Barker, Writing Software Documentation – A Task-Oriented Approach, 2nd Edition, Pearson Education, 2004.                                                                                                                                 |    |
| 4               | Rajib Mall, Fundamentals of Software Engineering, 2nd Edition, Prentice Hall.                                                                                                                                                                      |    |
| Web Resources   |                                                                                                                                                                                                                                                    |    |
| 1               | <a href="http://www/tutorialspoint.com/software_engineering">http://www/tutorialspoint.com/software_engineering</a>                                                                                                                                |    |

|   |                                                                                 |
|---|---------------------------------------------------------------------------------|
| 2 | <a href="http://www.nada.kth.se/lectures/">http://www.nada.kth.se/lectures/</a> |
| 3 | <a href="http://www2.latech.edu/">http://www2.latech.edu/</a>                   |

**Mapping Table:**

| <b>CO/PSO</b>                                          | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> |
|--------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                                             | <b>3</b>    | <b>2</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>2</b>    |
| <b>CO2</b>                                             | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    |
| <b>CO3</b>                                             | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    |
| <b>CO4</b>                                             | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    |
| <b>CO5</b>                                             | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>13</b>   | <b>12</b>   | <b>14</b>   | <b>14</b>   | <b>14</b>   | <b>13</b>   |

### CORE COURSE XIV: DIGITAL IMAGE PROCESSING

| Subject Code               | L                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | T | P | Semester | Credits | Inst. Hours | Marks |                     |       |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------|---------------------|-------|
|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |   |          |         |             | CIA   | External            | Total |
| 26UIT62                    | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0 | 0 | VI       | 4       | 4           | 50    | 50                  | 100   |
| <b>Learning Objectives</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |   |          |         |             |       |                     |       |
| <b>LO1</b>                 | To acquire fundamental knowledge of the introduction to Digital Image Processing.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |   |   |          |         |             |       |                     |       |
| <b>LO2</b>                 | To understand the features and concepts present in Digital Image Processing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             |       |                     |       |
| <b>LO3</b>                 | To study color image processing techniques.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   |   |          |         |             |       |                     |       |
| <b>LO4</b>                 | To understand image compression and morphological operations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |   |          |         |             |       |                     |       |
| <b>LO5</b>                 | To learn feature extraction and image segmentation methods.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   |   |          |         |             |       |                     |       |
| <b>Unit</b>                | <b>Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |   |          |         |             |       | <b>No. of Hours</b> |       |
| I                          | <b>Introduction &amp; Fundamentals:</b> Definition of Image and Digital Image Processing – Examples of Digital Image Processing – Fundamental Steps in Digital Image Processing – Components of an Image Processing System – Visual Perception – Image Acquisition – A Simple Image Model – Zooming and Shrinking of Digital Image                                                                                                                                                                                                             |   |   |          |         |             |       | 12                  |       |
| II                         | <b>Image Enhancement in Spatial Domain:</b> Introduction - Mathematical Analysis of Enhancement in Spatial Domain - Basic Gray Level Transformation - Histogram Processing - Histogram Equalization - Histogram Matching - Image Enhancement using Arithmetic and Logical Operation - Basic Transformations - Basics of Spatial Filtering <b>Image Enhancement in Frequency Domain:</b> Two Dimensional Fourier Transform and its Inverse - Basics of Filtering in Frequency Domain - Basic Frequency Domain Filters - Homomorphic Filtering . |   |   |          |         |             |       | 12                  |       |
| III                        | <b>Color Image Processing:</b> Introduction - Advantages of Color Image Processing - Categories of Color Image Processing - Color Fundamentals - Primary Colors - Secondary Color - Characteristics that are Used for Differentiating Different Colors - Color Models - Conversions between Color Models - Pseudo Color Image Processing - Color Transformation - Color Image Smoothing and Sharpening -Color Segmentation .                                                                                                                   |   |   |          |         |             |       | 12                  |       |

|    |                                                                                                                                                                                                                                                                                                                     |    |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| IV | <b>Image Compression:</b> Introduction - Mathematical Analysis - Types of Data Redundancies - Image Compression Model - Compression Strategies. Morphological Image Processing : Introduction - Basic Concept of Set Theory - Logic Operations Involving Binary Images - Dilation and Erosion - Opening and Closing | 12 |
| V  | <b>Features and Image Segmentation:</b> Introduction – Classification of Features – Features of an Image – Attributes of Features – Process of Feature Extraction – Image Segmentation – Thresholding – Region Based Segmentation - Corner Detection-Pixel Based Approach.                                          | 12 |

|                 |                                                                                                                                |    |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------|----|
| TOTAL HOURS     |                                                                                                                                | 60 |
|                 |                                                                                                                                |    |
| CO              | Course Outcomes                                                                                                                |    |
| CO1             | Acquire knowledge of image fundamentals.                                                                                       |    |
| CO2             | Understand image enhancement techniques in the Spatial Domain and Frequency Domain.                                            |    |
| CO3             | Understand color image processing operations.                                                                                  |    |
| CO4             | Understand image compression techniques.                                                                                       |    |
| CO5             | Understand image segmentation operations.                                                                                      |    |
| Text Books      |                                                                                                                                |    |
| 1               | Abhishek Yadav and Poonam Yadav, Digital Image Processing, University Science Press.                                           |    |
| Reference Books |                                                                                                                                |    |
| 1               | S. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, 2nd Edition, McGraw-Hill Education Pvt. Ltd., 2020. |    |
| 2               | Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, 4th Edition, Pearson Education, 2018.                       |    |
| 3               | Sridhar S., Digital Image Processing, 2nd Edition, Oxford University Press, 2016.                                              |    |

**Mapping Table:**

| <b>CO/PSO</b>                                  | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> |
|------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                                     | <b>3</b>    | <b>2</b>    | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>2</b>    |
| <b>CO2</b>                                     | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>2</b>    |
| <b>CO3</b>                                     | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    |
| <b>CO4</b>                                     | <b>3</b>    | <b>2</b>    | <b>2</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    |
| <b>CO5</b>                                     | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    | <b>3</b>    |
| Weightage of Course<br>Contributed to Each PSO | <b>13</b>   | <b>12</b>   | <b>14</b>   | <b>14</b>   | <b>14</b>   | <b>13</b>   |

**Strong-3**

**M-Medium-2**

**L-Low-1**

## CORE COURSE XV: IMAGE PROCESSING USING SCILAB PRACTICAL

| Subject Code | L | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|--------------|---|---|---|----------|---------|-------------|-------------|----------|-------|
|              |   |   |   |          |         |             | CIA         | External | Total |
| 26UCITP7     | 0 | 0 | 6 | VI       | 4       | 6           | 50          | 50       | 100   |

| Learning Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| <b>LO1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To acquire knowledge of basic programs in Digital Image Processing.                               |
| <b>LO2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To apply image enhancement techniques such as brightness, contrast, and negative.                 |
| <b>LO3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To implement image segmentation and edge detection methods.                                       |
| <b>LO4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To perform morphological operations like dilation and erosion.                                    |
| <b>LO5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To work with filters and color images, including RGB separation.                                  |
| Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                   |
| <ol style="list-style-type: none"> <li>1. Perform 2D linear convolution and circular convolution between two 2D matrices.</li> <li>2. Perform Discrete Fourier Transform (DFT) and Discrete Cosine Transform (DCT) on a 4×4 grayscale image.</li> <li>3. Perform brightness enhancement, contrast manipulation, and image negative operations on an image.</li> <li>4. Perform thresholding operation on an image.</li> <li>5. Perform edge detection using different edge detectors.</li> <li>6. Perform dilation and erosion operations.</li> <li>7. Apply low-pass and high-pass filters using a 3×3 mask.</li> <li>8. Read a color image and separate it into red, green, and blue planes.</li> </ol> |                                                                                                   |
| <b>TOTAL HOURS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                   |
| <b>75</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                   |
| CO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Course Outcomes                                                                                   |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Gain practical knowledge of 2D transformations.                                                   |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Gain practical knowledge of Discrete Cosine Transform (DCT) and Discrete Fourier Transform (DFT). |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Apply image enhancement techniques using SCILAB.                                                  |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Understand the application of different image segmentation techniques.                            |

|     |                                                           |
|-----|-----------------------------------------------------------|
| CO5 | Gain knowledge to perform different operations on images. |
|-----|-----------------------------------------------------------|

**Mapping Table:**

| CO/PSO                                                 | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|--------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                    | 2         | 2         | 2         | 3         | 3         | 2         |
| CO2                                                    | 3         | 3         | 2         | 3         | 2         | 3         |
| CO3                                                    | 2         | 3         | 3         | 3         | 2         | 3         |
| CO4                                                    | 2         | 3         | 2         | 3         | 3         | 3         |
| CO5                                                    | 2         | 2         | 2         | 3         | 3         | 2         |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>11</b> | <b>13</b> | <b>11</b> | <b>15</b> | <b>13</b> | <b>13</b> |

**Strong-3      M-Medium-2      L-Low-1**

### ELECTIVE VIIA: TRENDS IN COMPUTING

| Subject Code | L | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|--------------|---|---|---|----------|---------|-------------|-------------|----------|-------|
|              |   |   |   |          |         |             | CIA         | External | Total |

|          |   |   |   |    |   |   |    |    |     |
|----------|---|---|---|----|---|---|----|----|-----|
| 26UEIT61 | 4 | 0 | 0 | VI | 3 | 4 | 50 | 50 | 100 |
|----------|---|---|---|----|---|---|----|----|-----|

#### Learning Objective

|     |                                                                                                              |
|-----|--------------------------------------------------------------------------------------------------------------|
| LO1 | To learn current trends in various Computer Science and Information Technology fields.                       |
| LO2 | To learn various fields of Cloud Computing, Green Computing, Edge Computing, and Fog Computing technologies. |
| LO3 | To learn about the architecture and application design of Cloud, Edge, and Fog Computing.                    |
| LO4 | To understand computing security and improve security services in these technologies.                        |
| LO5 | To learn from various case studies in Cloud, Edge, and Fog Computing.                                        |

| Unit | Details                                                                                                                                                                                                                                                                                                            | No.of Hours |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| I    | <b>Era of Cloud Computing:</b> Introduction – Components of Cloud Computing – Cloud Types: Private, Public and Hybrid clouds – Limitations of the Cloud – Virtualization: Structure and Mechanisms.                                                                                                                | 12          |
| II   | <b>Cloud Computing Services:</b> Software as a Service (SaaS) – Platform as a Service (PaaS) – Infrastructure as a Service (IaaS) – Database as a Service (DBaaS) – Recent Trends in Cloud Computing and Standards – Data Security in Cloud – Risks and Challenges with Cloud Data – Security as a Service.        | 12          |
| III  | <b>Edge Computing:</b> Edge Computing and Its Essentials: Introduction- Edge Computing Architecture- Advantages and Limitations of Edge Computing Systems- Edge Computing Interfaces and Devices - Edge Analytics: Edge Data Analytics – Potential of Edge Analytics – Architecture of Edge Analytics – Case study | 12          |

|    |                                                                                                                                                                                                                                                                                                                                                                   |    |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| IV | <b>Edge Data storage Security:</b> Edge-Based Attack Detection and Prevention-Edge Computing Use Cases and Case Studies: Edge Computing High- Potential Use Cases.<br><br><b>Introduction to green computing</b> – Calculating carbon footprint-<br><b>Choosing Green PC path:</b> A green make over – Buying green computer- Choosing Earth Friendly peripherals | 12 |
| V  | <b>Fog Computing:</b> Introduction to Fog Computing – Architecture – Characteristics – Fog Computing Services – Fog Resource Estimation and Its Challenges – Fog Computing on 5G Networks – Fog Computing Use Cases and Case Studies.                                                                                                                             | 12 |

|                 |                                                                                                                                                                                                                   |    |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| TOTAL HOURS     |                                                                                                                                                                                                                   | 60 |
| Course Outcomes |                                                                                                                                                                                                                   |    |
| CO              | On completion of this course, students will be able to:                                                                                                                                                           |    |
| CO1             | Outline the concepts, applications, benefits, and limitations of various computing paradigms.                                                                                                                     |    |
| CO2             | Classify the computing technologies based on their architecture and infrastructure, and identify appropriate strategies.                                                                                          |    |
| C03             | Examine various cloud services and security threat exposure within a cloud computing infrastructure.                                                                                                              |    |
| CO4             | Assess the problems and solutions involved in various stages of different computing environments.                                                                                                                 |    |
| C05             | Discuss the importance of Cloud, Edge, and Fog technologies and implement innovative ideas and practices for regulating Green IT.                                                                                 |    |
| Text Book       |                                                                                                                                                                                                                   |    |
| 1               | Kailas Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Dr. Devan Shah, <i>Cloud Computing – Black Book</i> , Edition: 2020 (UNIT I & II: Chapters 1, 2, 3, 9, 11).                                              |    |
| 2               | K. Anitha Kumari, G. Sudha Sadasivam, D. Dharani, M. Niranjanamurthy, <i>EDGE Computing: Fundamentals, Advances and Applications</i> , First Edition, 2022, CRC Press (UNIT III & IV: Chapters 1, 2, 3, 4, 5, 6). |    |

|   |                                                                                                                                                                                         |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | Woody Leonhard and Katherine Murray, <i>Green Home Computing for Dummies</i> , Wiley Publishing Inc., 2009 (UNIT IV: Chapters 2, 5, 6, 7).                                              |
| 4 | Evangelos Markakis, George Mastorakis, Constandinos X. Mavromoutakis, Evangelos Pallis, <i>Cloud and Fog Computing in 5G Mobile Networks</i> , First Edition, 2017 (UNIT V: Chapter 2). |

#### Reference Books

|   |                                                                                                                                                                                         |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Raj Kumar Buyya, Christian Vecchiola, S. Thamarai Selvi, <i>Mastering Cloud Computing</i> , McGraw Hill Education, 2013.                                                                |
| 2 | Michael Miller, <i>Cloud Computing</i> , Pearson Education, 2009.                                                                                                                       |
| 3 | Shijun Liu, Bedir Tekinerdogan, Mikio Aoyama, Liang-Jie Zhang, <i>Edge Computing – EDGE</i> , 2018.                                                                                     |
| 4 | Flavio Bonomi, Rodolfo Milito, Jiang Zhu, Sateesh Addepalli, <i>Fog Computing and Its Role in the Internet of Things</i> , MCC '12, August 17, 2012, Helsinki, Finland, Copyright 2012. |

#### Web Resources

|    |                                                                                                                                                                                                                                   |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <a href="https://static.googleusercontent.com/media/www.google.com/en//green/pdfs/google-green-computing.pdf">https://static.googleusercontent.com/media/www.google.com/en//green/pdfs/google-green-computing.pdf</a> (CaseStudy) |
| 2. | <a href="http://whatiscloud.com/basic_concepts_and_terminology/cloud">http://whatiscloud.com/basic_concepts_and_terminology/cloud</a>                                                                                             |

#### Mapping Table:

| CO/PSO                                      | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---------------------------------------------|------|------|------|------|------|------|
| CO1                                         | 2    | 2    | 2    | 3    | 3    | 2    |
| CO2                                         | 3    | 3    | 2    | 3    | 2    | 3    |
| CO3                                         | 2    | 3    | 3    | 3    | 2    | 3    |
| CO4                                         | 2    | 3    | 2    | 3    | 3    | 3    |
| CO5                                         | 2    | 2    | 2    | 3    | 3    | 2    |
| Weightage of course contributed to each PSO | 11   | 13   | 11   | 15   | 13   | 13   |

Strong-3

M-Medium-2

L-Low-1

## ELECTIVE VII B:BIG DATA ANALYTICS

| Subject Code | L | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|--------------|---|---|---|----------|---------|-------------|-------------|----------|-------|
|              |   |   |   |          |         |             | CIA         | External | Total |
| 26UEIT62     | 4 | 0 | 0 | VI       | 3       | 4           | 50          | 50       | 100   |

### Course Objective

|     |                                                                                |
|-----|--------------------------------------------------------------------------------|
| LO1 | Understand the Big Data platform, its use cases, and MapReduce jobs.           |
| LO2 | Identify and understand the basics of clustering and decision tree techniques. |
| LO3 | Study association rules and recommendation systems.                            |
| LO4 | Learn the concepts of data streams and stream processing.                      |
| LO5 | Understand the concepts of NoSQL databases.                                    |

| Unit | Details                                                                                                                                                                                                                                                                                                                                                                                                                  | No.of Hours |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| I    | <b>Evolution of Big Data</b> – Best Practices for Big Data Analytics – Big Data Characteristics – Validating Big Data – The Promotion of the Value of Big Data – Big Data Use Cases – Characteristics of Big Data Applications – Perception and Quantification of Value – Understanding Big Data Storage – A General Overview of High-Performance Architecture – HDFS – MapReduce and YARN – MapReduce Programming Model | 12          |

|     |                                                                                                                                                                                                                                                                                                                                                           |    |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| II  | Advanced Analytical Theory and Methods :Overview of Clustering — K means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions . Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches. | 12 |
| III | <b>Advanced Analytical Theory and Methods:</b> Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a              | 12 |

|                        |                                                                                                                                                                                                                                                                                                                                                    |           |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                        | Decision Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier.                                                                                                                                                                                                                                                       |           |
| IV                     | Big Data and Hadoop : Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere Big Insights and Big Sheets                                       | 12        |
| V                      | <b>NoSQL Databases:</b> Schema-less Models – Increasing Flexibility for Data Manipulation – Key-Value Stores – Document Stores – Tabular Stores – Object Data Stores – Graph Databases – Hive – Sharding – HBase – Analyzing Big Data with Twitter – Big Data for E-Commerce – Big Data for Blogs – Review of Basic Data Analytic Methods using R. | 12        |
|                        | <b>TOTAL HOURS</b>                                                                                                                                                                                                                                                                                                                                 | <b>60</b> |
| <b>Course Outcomes</b> |                                                                                                                                                                                                                                                                                                                                                    |           |
| CO                     | On completion of this course, students will be able to:                                                                                                                                                                                                                                                                                            |           |
| CO1                    | Work with Big Data tools and apply appropriate data analysis techniques.                                                                                                                                                                                                                                                                           |           |
| CO2                    | Analyze data using clustering and classification algorithms.                                                                                                                                                                                                                                                                                       |           |
| CO3                    | Learn and apply data mining algorithms and recommendation systems for handling large volumes of data.                                                                                                                                                                                                                                              |           |
| CO4                    | Perform analytics on data streams.                                                                                                                                                                                                                                                                                                                 |           |
| CO5                    | Understand and work with NoSQL databases and their management.                                                                                                                                                                                                                                                                                     |           |

| <b>Text Book</b>       |                                                                                                                                                                                            |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                      | <b>Anand Rajaraman and Jeffrey David Ullman</b> , <i>Mining of Massive Datasets</i> , Cambridge University Press, 2012.                                                                    |
| <b>Reference Books</b> |                                                                                                                                                                                            |
| 1                      | <b>David Loshin</b> , <i>Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph</i> , Morgan Kaufmann / Elsevier Publishers, 2013. |
| 2                      | <b>EMC Education Services</b> , <i>Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing, and Presenting Data</i> , Wiley Publishers, 2015.                             |

| Web Resources |                                                                                                                                                         |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1             | <a href="https://www.simplilearn.com">https://www.simplilearn.com</a>                                                                                   |
| 2.            | <a href="https://www.sas.com/en_us/insights/analytics/big-data-analytics.html">https://www.sas.com/en_us/insights/analytics/big-data-analytics.html</a> |

**Mapping Table:**

| CO/PSO                                                 | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|--------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                    | 2         | 2         | 2         | 3         | 3         | 2         |
| CO2                                                    | 3         | 3         | 2         | 3         | 2         | 3         |
| CO3                                                    | 2         | 3         | 3         | 3         | 2         | 3         |
| CO4                                                    | 2         | 3         | 2         | 3         | 3         | 3         |
| CO5                                                    | 2         | 2         | 2         | 3         | 3         | 2         |
| <b>Weightage of course<br/>contributed to each PSO</b> | <b>11</b> | <b>13</b> | <b>11</b> | <b>15</b> | <b>13</b> | <b>13</b> |

**Strong-3      M-Medium-2      L-Low-1**

### ELECTIVE VIII A: NATURAL LANGUAGE PROCESSING

| Subject Code               | L                                                                                                                               | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|-------|
|                            |                                                                                                                                 |   |   |          |         |             | CIA         | External | Total |
| 26UEIT63                   | 4                                                                                                                               | 0 | 0 | VI       | 3       | 4           | 50          | 50       | 100   |
| <b>Learning Objectives</b> |                                                                                                                                 |   |   |          |         |             |             |          |       |
| <b>LO1</b>                 | To understand approaches to syntax and semantics in Natural Language Processing (NLP).                                          |   |   |          |         |             |             |          |       |
| <b>LO2</b>                 | To learn Natural Language Processing and apply basic algorithms used in this field.                                             |   |   |          |         |             |             |          |       |
| <b>LO3</b>                 | To understand approaches to discourse, generation, dialogue, and summarization with in NLP.                                     |   |   |          |         |             |             |          |       |
| <b>LO4</b>                 | To become acquainted with algorithmic descriptions of the main language levels: morphology, syntax, semantics, pragmatics, etc. |   |   |          |         |             |             |          |       |

|             |                                                                                                                                                                                                                                                                                                                                         |  |  |  |  |  |  |                     |  |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|---------------------|--|
| <b>LO5</b>  | To understand current statistical approaches used in machine translation.                                                                                                                                                                                                                                                               |  |  |  |  |  |  |                     |  |
| <b>Unit</b> | <b>Contents</b>                                                                                                                                                                                                                                                                                                                         |  |  |  |  |  |  | <b>No. of.Hours</b> |  |
| I           | <b>Introduction:</b> Natural Language Processing tasks in syntax, semantics, and pragmatics – Issues – Applications – The role of Machine Learning – Probability Basics – Information Theory – Collocations – N-gram Language Models – Estimating Parameters and Smoothing – Evaluating Language Models.                                |  |  |  |  |  |  | <b>12</b>           |  |
| II          | <b>Word Level and Syntactic Analysis :</b> <b>Word Level Analysis:</b> Regular Expressions – Finite-State Automata – Morphological Parsing – Spelling Error Detection and Correction – Words and Word Classes – Part-of-Speech Tagging. <b>Syntactic Analysis:</b> Context-Free Grammar – Constituency Parsing – Probabilistic Parsing. |  |  |  |  |  |  | <b>12</b>           |  |
| III         | <b>Semantic Analysis and Discourse Processing:</b><br><b>Semantic Analysis:</b> Meaning Representation – Lexical Semantics – Ambiguity – Word Sense Disambiguation.<br><b>Discourse Processing:</b> Cohesion – Reference Resolution – Discourse Coherence and Structure.                                                                |  |  |  |  |  |  | <b>12</b>           |  |
| IV          | <b>Natural Language Generation:</b> Natural Language Generation: Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine                                                                                                                                        |  |  |  |  |  |  | <b>12</b>           |  |

|                        |                                                                                                                                                                                                                                                                                                                       |           |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                        | Translation - Machine Translation Approaches-Translation involving Indian Languages - Evaluation of MT Systems.                                                                                                                                                                                                       |           |
| V                      | <b>Information Retrieval and Lexical Resources: Information Retrieval:</b> Design Features of Information Retrieval Systems – Classical, Non-Classical, and Alternative Models of Information Retrieval – Evaluation. <b>Lexical Resources:</b> WordNet – FrameNet – Stemmers – POS Tagger – Research Corpora – SSAS. | <b>12</b> |
| <b>TOTAL HOURS</b>     |                                                                                                                                                                                                                                                                                                                       | <b>60</b> |
| <b>Course Outcomes</b> |                                                                                                                                                                                                                                                                                                                       |           |
| CO                     | On completion of this course, students will                                                                                                                                                                                                                                                                           |           |
| CO1                    | Understand the fundamental concepts and techniques of Natural Language Processing (NLP).                                                                                                                                                                                                                              |           |
| CO2                    | Compare different NLP technologies and evaluate their advantages and disadvantages in business applications.                                                                                                                                                                                                          |           |
| CO3                    | Apply NLP methods to analyze text data, including sentiment analysis and topic modeling.                                                                                                                                                                                                                              |           |
| CO4                    | Use NLP tools to explore and interpret large volumes of real-world text data.                                                                                                                                                                                                                                         |           |
| CO5                    | Develop basic Robotic Process Automation (RPA) solutions to improve business process efficiency.                                                                                                                                                                                                                      |           |
| <b>Text Books</b>      |                                                                                                                                                                                                                                                                                                                       |           |
| 1                      | Daniel Jurafsky and James H. Martin, Speech and Language Processing, Pearson Publications.                                                                                                                                                                                                                            |           |

|                 |                                                                                                                                                                                                 |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2               | Allen, James, Natural Language Understanding, Pearson Education, 1995.                                                                                                                          |
| Reference Books |                                                                                                                                                                                                 |
| 1               | Pierre M. Nugues, An Introduction to Language Processing with Perl and Prolog, pringer.                                                                                                         |
| Web Resources   |                                                                                                                                                                                                 |
| 1               | <a href="https://en.wikipedia.org/wiki/Natural_language_processing">https://en.wikipedia.org/wiki/Natural_language_processing</a>                                                               |
| 2               | <a href="https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP">https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP</a> |

**Mapping Table:**

| <b>CO/PSO</b>                                          | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> |
|--------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO 1</b>                                            | 3           | 3           | 3           | 3           | 3           | 3           |
| <b>CO 2</b>                                            | 2           | 3           | 3           | 3           | 2           | 3           |
| <b>CO 3</b>                                            | 3           | 3           | 3           | 3           | 3           | 3           |
| <b>CO 4</b>                                            | 3           | 2           | 3           | 3           | 2           | 3           |
| <b>CO 5</b>                                            | 3           | 3           | 3           | 3           | 3           | 3           |
| <b>Weightage of course<br/>contributed to each PSO</b> | 14          | 14          | 15          | 15          | 13          | 15          |

**Strong-3**

**M-Medium-2**

**L-Low-1**

## ELECTIVE VIII B: CYBER SECURITY

| Subject Code              | L                                                                                                                                                                                                                                                                                                                                                                                                           | T | P | Semester | Credits | Inst. Hours | Total Marks |                     |       |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----------|---------|-------------|-------------|---------------------|-------|
|                           |                                                                                                                                                                                                                                                                                                                                                                                                             |   |   |          |         |             | CIA         | External            | Total |
| 26UEIT64                  | 4                                                                                                                                                                                                                                                                                                                                                                                                           | 0 | 0 | VI       | 3       | 4           | 50          | 50                  | 100   |
| <b>Learning Objective</b> |                                                                                                                                                                                                                                                                                                                                                                                                             |   |   |          |         |             |             |                     |       |
| LO1                       | Understand the cyber security threat landscape.                                                                                                                                                                                                                                                                                                                                                             |   |   |          |         |             |             |                     |       |
| LO2                       | Develop a deeper understanding and familiarity with various types of cyber attacks, cybercrimes, vulnerabilities, and their remedies.                                                                                                                                                                                                                                                                       |   |   |          |         |             |             |                     |       |
| LO3                       | Analyze and evaluate existing legal frameworks and laws related to cyber security.                                                                                                                                                                                                                                                                                                                          |   |   |          |         |             |             |                     |       |
| LO4                       | Analyze and evaluate digital payment system security and remedial measures against digital payment frauds.                                                                                                                                                                                                                                                                                                  |   |   |          |         |             |             |                     |       |
| LO5                       | Analyze and evaluate the importance of personal data, including its privacy and security.                                                                                                                                                                                                                                                                                                                   |   |   |          |         |             |             |                     |       |
| <b>Unit</b>               | <b>Details</b>                                                                                                                                                                                                                                                                                                                                                                                              |   |   |          |         |             |             | <b>No. of Hours</b> |       |
| I                         | <b>Introduction to Cyber security:</b> Defining Cyberspace and Overview of Computer and Web Technology – Architecture of Cyberspace – Communication and Web Technology – Internet – World Wide Web – Advent of the Internet – Internet Infrastructure for Data Transfer and Governance – Internet Society – Regulation of Cyberspace – Concept of Cyber security – Issues and Challenges of Cyber security. |   |   |          |         |             |             | 12                  |       |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| II | <p>Cyber Crime and Cyber Law : Classification of cyber crimes, Common cyber crimes – cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cyber criminals modus operandi, Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India, Case studies.</p> | 12 |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| III                    | Social Media Overview and Security : Introduction to Social networks, Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.                                                                                                                                                                             | 12        |
| IV                     | E-Commerce and Digital Payments : E - C o m m e r c e and Digital Payments: Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorised banking transactions. Relevant provisions of Payment Settlement Act,2007 Payment and Settlement Systems Act, 2007. | 12        |
| V                      | Digital Devices Security, Tools and Technologies for Cyber Security : End point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Anti-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.                                                                                                                                                                                                               | 12        |
|                        | <b>TOTAL HOURS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>60</b> |
| <b>Course Outcomes</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |
| CO                     | On completion of this course, students will                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |
| CO1                    | Understand the concept of Cyber Security and the issues and challenges associated with it.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |
| CO2                    | Understand cyber crimes, their nature, legal remedies, and how to report crimes through available platforms and procedures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |
| CO3                    | They will appreciate various privacy and security concerns on online social media and understand the reporting procedure of inappropriate content, underlying legal aspects, and best practices for the use of social media platforms.                                                                                                                                                                                                                                                                                                                                                                                                                                |           |

|     |                                                                                                                                                                                                                                                    |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO4 | Understand the basic concepts related to E-Commerce and digital payments. They will become familiar with various digital payment modes and related cyber security aspects, RBI guidelines, and preventive measures against digital payment frauds. |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|     |                                                                                                                                                         |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO5 | Understand the basic security aspects related to computers and mobiles. They will be able to use basic tools and technologies to protect their devices. |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------|

| Reference Books |                                                                                                                                                                                 |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1               | Cyber Crime Impact in the New Millennium, by R. C. Mishra, Author Press, Edition 2010.                                                                                          |
| 2               | Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011).          |
| 3               | Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform (Pearson, 13th November, 2001). |
| 4               | Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt. Ltd.                                                                                                          |
| 5               | Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K., Dominant Publishers.                                                                                       |
| 6               | Network Security Bible by Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.                                                                          |
| 7               | Fundamentals of Network Security by E. Maiwald, McGraw Hill.                                                                                                                    |

#### Mapping Table:

| CO/PSO                                             | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                | 2         | 2         | 2         | 3         | 3         | 2         |
| CO2                                                | 3         | 3         | 2         | 3         | 2         | 3         |
| CO3                                                | 2         | 3         | 3         | 3         | 2         | 3         |
| CO4                                                | 2         | 3         | 2         | 3         | 3         | 3         |
| CO5                                                | 2         | 2         | 2         | 3         | 3         | 2         |
| <b>Weightage of course contributed to each PSO</b> | <b>11</b> | <b>13</b> | <b>11</b> | <b>15</b> | <b>13</b> | <b>13</b> |

## CORE XVI : PROJECT WITH VIVA VOCE

| Subject Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | L                                                             | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|---|---|----------|---------|-------------|-------------|----------|-------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                               |   |   |          |         |             | CIA         | External | Total |
| 26UIT6P                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0                                                             | 0 | 6 | VI       | 5       | 6           | 50          | 50       | 100   |
| Learning Objective                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                               |   |   |          |         |             |             |          |       |
| LO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To apply theoretical knowledge in real-time applications.     |   |   |          |         |             |             |          |       |
| LO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To design and develop practical systems in the chosen domain. |   |   |          |         |             |             |          |       |
| LO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To improve problem-solving and analytical skills.             |   |   |          |         |             |             |          |       |
| LO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To gain experience in project implementation and testing.     |   |   |          |         |             |             |          |       |
| LO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To develop proper documentation and technical skills.         |   |   |          |         |             |             |          |       |
| <p>1. <b>Group Size</b>- Each project group shall consist of <b>3 to 4 students</b> from the same department.</p> <p>2. <b>Project Type</b> -The project must be a <b>real-time application / system development project</b> related to the core subject area.</p> <p>3. <b>Documentation</b> - Each group must submit:</p> <ul style="list-style-type: none"> <li>• Project Proposal</li> <li>• System Design (UML / DFD / Architecture)</li> <li>• Implementation Details</li> <li>• Testing Report</li> <li>• Final Project Report (as per department format)</li> </ul> <p>4. <b>Review Process</b> -There will be <b>periodic reviews</b> (Review 1, Review 2, Final Review). Attendance is compulsory for all group members.</p> <p>5 <b>Individual Contribution</b> -Every member must clearly explain their individual contribution during reviews and viva voce.</p> <p>6. <b>Source Code Submission</b> - Complete source code and related files must be submitted in soft copy along with the report.</p> <p>7. <b>Presentation &amp; Viva</b> - All group members must participate in the final presentation and viva examination.</p> |                                                               |   |   |          |         |             |             |          |       |

| <b>Course Outcomes</b> |                                                                                                            |
|------------------------|------------------------------------------------------------------------------------------------------------|
| CO                     | On completion of this course, students will                                                                |
| CO1                    | Apply technical knowledge to design and develop a real-time software solution for a defined problem.       |
| CO2                    | Analyze and solve complex problems using appropriate tools, techniques, and technologies.                  |
| CO3                    | Design, implement, and test a complete system following software development life cycle (SDLC) principles. |
| CO4                    | Demonstrate teamwork and project management skills through effective collaboration and task distribution.  |
| CO5                    | Communicate technical concepts effectively through project documentation, presentation, and viva voce..    |

**Mapping Table:**

| CO/PSO                                             | PSO1      | PSO2      | PSO3      | PSO4      | PSO5      | PSO6      |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                | 2         | 2         | 2         | 3         | 3         | 2         |
| CO2                                                | 3         | 3         | 2         | 3         | 2         | 3         |
| CO3                                                | 2         | 3         | 3         | 3         | 2         | 3         |
| CO4                                                | 2         | 3         | 2         | 3         | 3         | 3         |
| CO5                                                | 2         | 2         | 2         | 3         | 3         | 2         |
| <b>Weightage of course contributed to each PSO</b> | <b>11</b> | <b>13</b> | <b>11</b> | <b>15</b> | <b>13</b> | <b>13</b> |

**Strong-3      M-Medium-2      L-Low-1**

### ABILITY ENHANCEMENT COURSE – II: DESIGN THINKING

| Subject Code | L | T | P | Semester | Credits | Inst. Hours | Total Marks |          |       |
|--------------|---|---|---|----------|---------|-------------|-------------|----------|-------|
|              |   |   |   |          |         |             | CIA         | External | Total |
| 26UAEC61     | 2 | 0 | 0 | VI       | 2       | 2           | 50          | 50       | 100   |

| Learning Objectives |                                                                                                                     |
|---------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>LO1</b>          | To recall and describe the key concepts, stages, and principles of Design Thinking.                                 |
| <b>LO2</b>          | To explain the importance of empathy, ideation, and prototyping in solving user-entered problems.                   |
| <b>LO3</b>          | To apply Design Thinking methods such as brainstorming, empathy mapping, and SCAMPER to real-world problems.        |
| <b>LO4</b>          | To analyze user needs and problem statements using observation and structured frameworks.                           |
| <b>LO5</b>          | To design innovative solutions and develop prototypes based on insights gained through the design Thinking process. |

| Unit       | Contents                                                                                                                                                                                                                                                                                                                                                              | No. of Hours |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>I</b>   | <b>Introduction to Design Thinking</b> - Introduction to Design Thinking, Essential Design Thinking Skills, Core Principles of Design Thinking, Foundations of Design Thinking, Building an Effective Design Thinking Team, Discussion of Problems from IT sector.                                                                                                    | <b>6</b>     |
| <b>II</b>  | <b>Design Thinking Phases</b> -Stages of Design Thinking, Role of observation in understanding product and process challenges, Preparation of AEIOU and other canvases with defined problem statement, Exploring Design Thinking innovations, Understanding the Role of Design Thinking in Product and Process Innovation, Double Diamond model and its applications. | <b>6</b>     |
| <b>III</b> | <b>Design Thinking Techniques</b> -Understanding, listening and Empathizing Techniques, Exploring observation methods, Utilizing a structured, open-ended approach for effective communication, Ideation Labs, Brainstorming techniques for idea generation, Applying innovation to foster creativity, Application of SCAMPER technique to support Problem Statement  | <b>6</b>     |

**Suggested MOOC Courses**

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |    |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| IV                       | <b>Prototyping Methods</b> -Methods and Tools for Design Thinking Practice; Empathize: Ask five why questions, Empathy map, storytelling, critical items diagram, mind map, journey map; Ideate: Brainstorming, 2x2 matrix, Need-Approach-Benefit-Competition (NABC) Methods; Prototype: Exploration map, Minimum Viable Product (MVP), Feasibility Testing, Viability Testing, A/B Testing, Sustainability Verification, Collect Feedback, Iterate and Improve, PDC canvas versioning | 6  |
| V                        | <b>Case Studies</b> -Quick-Commerce Applications – Food and Grocery Delivery (eg. Swiggy, Instamart), Uber, OLA, Rapido, E-Commerce Applications – Online Shopping (eg. Amazon), Online Publishing (eg. Canva), Online Ticket Booking (eg. BookMyShow), Fintech apps (eg. Google Pay, Razorpay etc.)                                                                                                                                                                                   | 6  |
| TOTAL HOURS              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 30 |
| CO                       | Course Outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |    |
| CO1                      | Understand the fundamental principles and importance of Design Thinking in fostering innovation, ethics and its relevance.                                                                                                                                                                                                                                                                                                                                                             |    |
| CO2                      | Apply systematic problem identification, problem framing, articulation, and problem-solving approaches in the context of Design Thinking                                                                                                                                                                                                                                                                                                                                               |    |
| CO3                      | Analyze and evaluate different tools and methodologies used in Design Thinking, such as observation, ethnographic research and mind mapping to gain insights into users’ needs                                                                                                                                                                                                                                                                                                         |    |
| CO4                      | Develop and refine product concepts by preparing product development canvases (PDC) that consider product experience, functions, features, and sustainable development of the components                                                                                                                                                                                                                                                                                               |    |
| CO5                      | Create a final working prototype for projects with limitations, documenting the functionality and features, viability, sustainability, scalability, cost and resource utilization for the product                                                                                                                                                                                                                                                                                      |    |
| Open Source and Websites |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |    |
| 1                        | Google Workspace: Docs, Sheets and Slides                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |
| 2                        | Google Jamboard                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |    |

|                                                                                                                                |                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3                                                                                                                              | Mind-mapping tools: Wise mapping, Free plane, Semantik                                                                                                               |
| <b>Reference Books</b>                                                                                                         |                                                                                                                                                                      |
| 1.                                                                                                                             | Soni, Pavan. Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem-solving. Penguin Random House India Private Limited, 2020              |
| 2.                                                                                                                             | Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins e-books (2009)                                      |
| 3                                                                                                                              | Liedtka, Jeanne, Randy Salzman, and Daisy Azer. Design thinking for the greater good: Innovation in the social sector. Columbia University Press, 2019               |
| ➤                                                                                                                              | B. K. Chakravarthy, Design Technology and Innovation, SWAYAM NPTEL (Online)                                                                                          |
| ➤                                                                                                                              | B. K. Chakravarthy, Innovation by Design, SWAYAM NPTEL (Online)                                                                                                      |
| ➤                                                                                                                              | Nina Sabnani, Understanding Design, SWAYAM NPTEL (Online)                                                                                                            |
| <b>Note: Activities are to be performed in a team size of 3-4 students. Report is to be prepared based on these activities</b> |                                                                                                                                                                      |
| ➤                                                                                                                              | Brainstorm and explore various problems in IT field. Select an appropriate problem, draft a Problem Statement and get it approved for performing further activities. |
| ➤                                                                                                                              | Design AEIOU canvas                                                                                                                                                  |
| ➤                                                                                                                              | Design Empathy map                                                                                                                                                   |

**Mapping Table:**

| CO/PSO                                             | PSO 1     | PSO 2     | PSO 3     | PSO 4     | PSO 5     | PSO 6     |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| CO1                                                | 3         | 2         | 2         | 2         | 2         | 3         |
| CO2                                                | 3         | 2         | 2         | 2         | 3         | 2         |
| CO3                                                | 3         | 3         | 3         | 3         | 2         | 2         |
| CO4                                                | 3         | 2         | 2         | 2         | 2         | 3         |
| CO5                                                | 3         | 3         | 2         | 2         | 3         | 2         |
| <b>Weightage of course contributed to each PSO</b> | <b>15</b> | <b>12</b> | <b>11</b> | <b>11</b> | <b>12</b> | <b>12</b> |

**Strong-3      M-Medium-2   L-Low-1**